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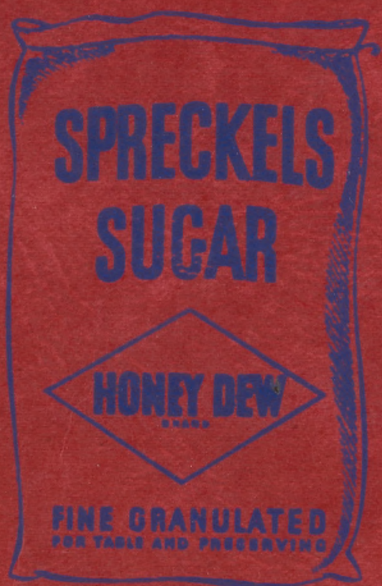

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SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

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1

IT'S PLANTING TIME

—and the time to lay plans for all springtime beet field operations.

GETTING A STAND

CONTROLLING WEEDS

THINNING

are the steps to a profitable sugar beet crop. Some valuable studies on these important subjects are presented in this issue.

MODERN SEED VARIETIES COMPARED WITH EUROPEAN OLD TYPE

By WILLIAM DUCKWORTH

Assistant Field Superintendent, Spreckels Sugar Company

FROM time to time when sugar beet growers "talk beets," the conversation turns to the various sugar beet varieties and the inevitable comparison of the "good old" European varieties with our present domestic varieties. Spreckels Sugar Company has been intimately concerned with the improvement of sugar beet varieties and has, therefore, over a period of nearly two decades, conducted field trials for the purpose of comparing the relative performance of varieties as they have been developed for commercial production.

Domestic seed was first produced for commercial plantings during World War I when the United States, cut off from German seed sources, began to grow its own stock as straight increases of European varieties. As seed yields were smaller than expected and production costs high, importing of seed was resumed when trade again became possible following the war. In ensuing years, destruction of beet crops by curly top disease became critically serious in States west of the Rocky Mountains. In 1925, a direct attack against curly top by disease-resistant breeding was started in the Bureau of Plant Industry of the U. S. D. A. The breeding program developed U. S. #1 as the first sugar beet variety with resistance to curly top and released it for commercial plantings in 1933. U. S. #1 was followed in 1935 by U. S. #33 and U. S. #34. Since then, other varieties have been developed which combine curly top resistance with increased resistance to other diseases, increased yield, high sucrose, and non-bolting characteristics. Of these later varieties, those in most common use in California are U. S. 15, U. S. 22, U. S. 41, and U. S. 56.

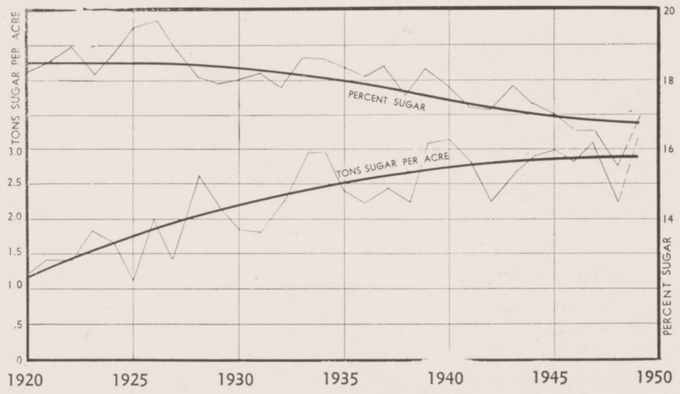
A critical evaluation is necessary to see how newly developed varieties compare with established commercial varieties and how domestic varieties compare with European varieties under California conditions. For this purpose, it is desirable to make the comparison in three general periods.

1) 1932-1935. European varieties were used almost exclusively for commercial plantings.
During this period, European variety R & G Old Type was compared with the new domestic variety U. S. #1 and was found to be superior in yield of beets, but not significantly higher in percent sugar. These results were obtained under conditions where curly top was not a factor affecting yield.

2) 1936-1940. European varieties were being replaced by improved domestic varieties.
Under disease free conditions, the yield in sugar per acre of Old Type and the leading domestic varieties was equal, with no significant differences appearing in tons beets per acre or percent sugar; however, when disease was a factor, significant differences in all three classifications manifest themselves with the yield in sugar per acre of Old Type being reduced below the leading domestic varieties.

3) 1941-1949. European varieties almost exclusively replaced by domestic varieties.
During this period, European varieties have been replaced by domestic varieties in commercial production; however, leading European varieties were maintained in field trials to ascertain the relative performance of domestic commercial varieties and newly developed domestic varieties. The variety trials for this period were divided into two groups; those in which curly top was present, and those in which the disease was not considered a factor affecting yield. From the results of these trials, conducted by Spreckels Sugar Company, it can be generally concluded that under conditions where curly top is not an important factor affecting yields, **the European variety Old Type is equal to but no better than most of the commercial varieties now being used. Where curly top is a factor, the yield of Old Type falls far below that of the resistant domestic commercial varieties.**

This demonstration of equality in performance of European and domestic varieties might be questioned in view of the fact that sugar percent has been lower during recent years than during the pre-war years in which European varieties were used in commercial production. A good deal of the decrease can be explained by advances in methods of sugar beet production and harvest. The advances in methods of harvest have had an immediate effect on sugar percent. Mechanical topping and rapid movement from field to factory have decreased the percent sugar, but have increased the yield of sugar per acre—the basis upon which returns to the grower are determined. A more general use of nitrogen fertilizer may have depressed the percent sugar, but has resulted in increased returns to the grower by increasing the yield of sugar per acre. The following chart demonstrates these trends graphically.



TRENDS IN YIELDS and sugar over the past 30 years in California. While percent sugar has dropped about 2%, tons sugar per acre has nearly tripled.

Some actual cases demonstrating the relative performance of modern varieties and Old Type may be of interest. (See tables on page 7.)

(Continued on Page 7)

INSECTS AND DISEASES CONTROLLED BY SEED TREATMENT

By HARRY LANGE, JR.
Assistant Entomologist, and
L. D. LEACH
Plant Pathologist, University of California, Davis

TREATMENT of sugar beet seed with lindane, (the purified gamma isomer of benzene hexachloride), now appears to be an inexpensive, safe, and effective method for the protection of germinating seed and seedlings from wireworm attack.

Prior to 1943 extensive chemical control of wireworms attacking sugar beets was not feasible as either the chemicals did not adequately control wireworms, or they were too expensive for large scale field application. We now have effective chemicals. The soil fumigants EDB and dichloropropene mixtures are effective but are costly in comparison with seed treatment. Many new chlorinated hydrocarbons such as DDT, chlordane, and lindane, can be applied to the entire soil surface and disked into the upper few inches of the soil. These applications are often adequate, but may be more costly than seed treatment, may tend to build up large amounts of chemicals in the soil which in some cases cause adverse effects to plant growth, or may affect the flavor of edible portions of certain crops grown in rotations with sugar beets.

The initial laboratory trials with technical grades of benzene hexachloride upon sugar beet seed were made in 1946. In the spring of 1947 Chester Locke of Lockeford, San Joaquin County, treated several hundred pounds of sugar beet seed and obtained good wireworm kill and satisfactory stands in areas heavily infested with the Pacific coast wireworm. This trial was followed by field experiments at Woodland in cooperation with Ralph Dunham and Harry Venning. Later tests were made in other areas and during 1949 over 100,000 pounds of sugar beet seed were treated with lindane in combination with one of the fungicides.

The first laboratory trials and field applications were made with a technical grade of benzene hexachloride having a characteristic musty odor. Since this time it has been found advantageous to use lindane, the purified gamma isomer, as it is not only less toxic to the germinating seeds, but is also less offensive to the operator during treating and to the grower during planting.

Four years of laboratory, greenhouse, and field observations indicate that a dosage of 4 ounces of actual lindane (16 ounces of 25 per cent or 5.33 ounces of 75 per cent) per 100 pounds of seed is safe and effective. This dosage amounts to 0.20 ounce of actual lindane per acre provided 5 pounds of sugar beet seed are planted per acre. A reduction to 2 ounces of actual lindane per 100 pounds of seed reduces the insecticidal efficiency although an increase above 4 ounces does not increase the effect upon wireworms.

Lindane can be applied to the seed as a dry, wettable powder in rotating mixers and enough water

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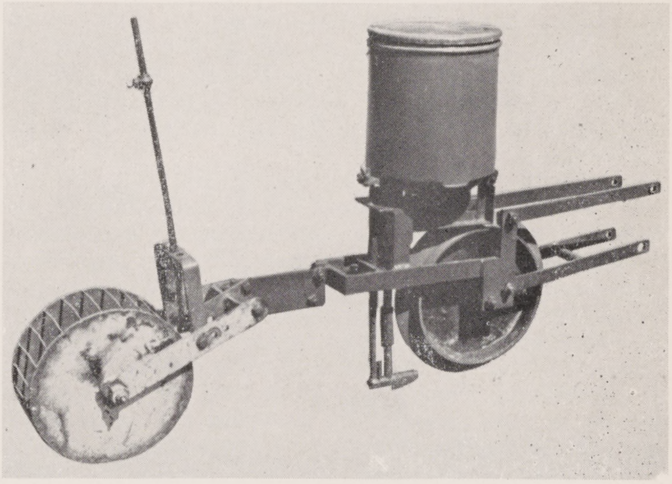
SOMETHING NEW ON EMERGENCE

By HARVEY P. H. JOHNSON
AND JAMES H. FISCHER
The Beet Sugar Development Foundation
Fort Collins, Colorado

EMERGENCE devices by the score have been tested through cooperative work with the Colorado A. & M. Experiment Station and The Beet Sugar Development Foundation. This work started in 1946. Each year since, tools have been checked, rechecked, refined, added to or eliminated. The most promising device is the furrow former wheel which compacts soil below the seed before it is dropped. This 30 pound wheel with a wedge-shaped outer surface opens the furrow with a firm pressure which in turn encourages a more rapid capillary movement of moisture. Essential in the construction is the shoe following the wheel which must be designed so to drop the seed before the soil flows back in the compacted furrow. Trials in 1949 indicated that the type of press wheel following this furrow forming method of planting was of little consequence, in fact, as good emergence resulted where only a chain was used to pull the soil over the seed. The squirrel cage type of press wheel shown in the picture has definite merit in that it leaves the soil mulched after planting, thus reducing a tendency of present press wheels to cause crusting.



3

THIS IS an experimental planter unit built around the furrow-forming wheel opener and "Squirrel Cage" press wheel.

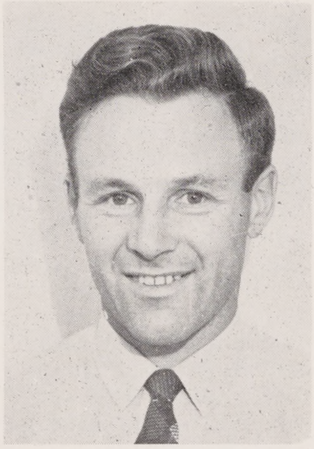
What about results from this device? A total of 18 experiments this past year shows an improvement of about one-third more plants per foot of row with the furrow former wheel plantings as against the standard double disc furrow opener with concave press wheel which is the common commercial planter used in many areas of United States. In more carefully conducted tests this increase was as high as 61%.

Soil moistures were taken in some of the tests to determine the difference in per cent moisture for the soil surrounding the seed. The following graph shows the result from an average of 24 replications on two

(Continued on Page 8)

CONTROL OF ANNUAL GRASSES IN SUGAR BEETS

By L. E. WARREN
Agricultural Research Specialist, Dow Chemical Company



4

WEEDS have presented to the sugar beet grower a problem that has been attacked for many years by cultivation and hand hoeing. Hoeing often has proved to be unreasonably expensive and sometimes unreliable. Also, the desirability of cultivation, for other than weed control purposes, is questionable. However, these have been the only means known to eliminate or reduce the harmful weed population between and in the rows.

Recently beet growers have made increasing use of general contact chemicals for weed control as pre-emergence sprays to kill weeds that emerge ahead of the beets, as well as selective sprays to kill the weeds in growing beets. These both have been valuable, but since later germinating weeds usually reduce the benefit of pre-emergence treatments, and selective sprays are not effective on grasses, it is still necessary to find a control of annual grasses in growing beets.

Grasses, as well as other weeds, not only compete with the beets for nutrients, water and sunlight, but interfere with harvest operations. Considerable expense often has been incurred by the grower to remove these weeds only to have the field reinfested by harvest time. It is conceivable that grasses could be eliminated from sugar beets by (1) a selective chemical that would not harm the beets, or (2) a general contact spray, placed so that the beets would not be injured, completely covering the soil surface between and in the rows.

A newly introduced grass killer called STCA (sodium trichloroacetate[1]) promises to aid considably in our fight against annual grasses. This chemical, which is easily soluble in water, attacks the grasses through their roots, and, therefore, must be present in the soil to be effective. At the rates needed STCA will not injure sugar beets at any growth stage under conditions tested so far whether used as an overall spray or placed below the leaves.

Trials last summer were conducted at the Dennis Leary ranch at Ryde, the Gene Winters ranch at Woodland, and others in cooperation with the Spreckels Sugar Company. Application of STCA was made by ground sprayer at intervals of a few hours to several days prior to either rain, sprinkling, or furrow irrigation. The watergrass, which was the predominant weed in these fields, was in all growth stages. STCA up to 16 pounds per acre was applied to all stages of sugar beets from before emergence to nearly full grown.

[1] Marketed as Dow Sodium TCA 90%.

Best results were obtained in these tests with 6 to 8 pounds of STCA per acre applied before germination of the grasses or while they are less than 2″ high, and when irrigation followed application within 3 to 4 days. Results of tests at the Leary ranch are shown below. A slight marginal leaf

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THE GRASS-FREE rectangle in the foreground is part of the STCA plot on the Dennis Leary ranch at Ryde.

burn from overall sprays at higher temperatures was the only observable effect on the beets. These trials were conducted on medium textured soils; because of leaching, lighter soils may require somewhat more than 6 to 8 pounds of chemical, but good control should be obtained with these dosages on heavier soil types.

The culture of beets, including their response to chemicals, has shown them to be very hardy plants after they have reached the 5 to 6 leaf stage. The leaves may be severely damaged by cultivation, rolling or sprays, but the crop recovers quickly, with no effect on the root development. Because of this plans were made to test the effect of directing a contact chemical spray to cover the complete soil surface below the beet leaves.

In other phases of the trials mentioned previously, it was learned that beets in good growing condition had to be about 14″ high before they would stand a contact spray that could kill young grasses. Therefore, shields were used to protect the younger beets. With these shields, nearly a direct spray was necessary to cause more than a leaf burn on the crop after the 5 to 6 leaf stage.

In a field of nearly full grown beets near Davis, the following treatments per acre were applied to a thick stand of very young watergrass. (See cut at head of next column.)

1 qt. of Dow General[2] in 40 gallons of diesel oil (no water)

1 qt. of Dow General in 25 gallons of diesel oil added to 25 gallons of water (plus wetting agent)

The sprays were placed so they overlapped across the rows beneath the leaves.

[2] Dinitro sec-butyl phenol 55%.

(Continued on Page 7)

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LATE-EMERGING watergrass covered the ground under nearly mature beet foliage. This is a typical condition, and can ruin a beet crop unless controlled.

The Dow General in oil alone seemed slightly superior to the emulsion spray, but both proved effective.

The equipment to apply this test was arranged by Mr. Austin Armer of Spreckels Sugar Company. Shields to lift the beet leaves above the spray consisted of 10″ ditching shovels fitted with 24″ strips of belting held against the beet leaves by pieces of spring steel on the lower side. The nozzles were suspended on special pipe supports behind these shields for adequate protection. Both shields and nozzle supports were attached to the center tool bar of a Farmall "M" tractor, and the power for the spraying operation was supplied by an Essick Air Power sprayer towed behind. The nozzles were at a height of 11″ to 13″ above the ground and directed downward, but placed so the edges of the fans overlapped to cover the bases of the beets. In other trials, the writer used duckfeet weeders with steel straps welded to extend back of the nozzles and to lift the leaves sufficiently. In still others, where the beets were younger, the shields were vertical and set to run as close to the row as possible, but yet provided adequate protection.

A grower can use any arrangement he has available that can perform the operation. The entire set-up can be mounted on the tractor if desired, using a 50 gallon drum for the tank, and the power take-off to operate the pump. Shields can be attached to the tool bar to coincide with the planter rows, as the cultivator does now.

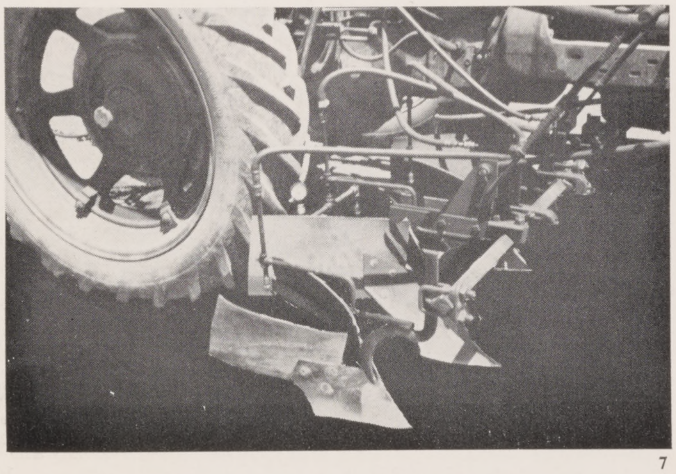
For best control the grasses should be sprayed as soon as possible after emergence, but before they are 2″ high. The weed control program in sugar beets could include STCA properly timed to the germination of the grass and irrigation at any time during the season, followed if necessary, by another STCA spray or a contact chemical treatment.

Either the general contact or STCA treatment or both can be adapted easily to the normal culture of sugar beets with substantial savings. Naturally the present costs of producing a crop must be reduced by these new methods to make them attractive. Some of the costs involved are listed below in amounts per acre per treatment.

Treatment per acre	Cost per acre
1 qt. Dow General in 25 to 50 gal. Diesel Oil	\$5.00 to \$7.00
6 to 8 pounds STCA[2]	4.00 to 5.00

[2]STCA can be applied with the above contact chemicals but the burn on the leaves and crown buds of the sugar beets will be increased.

(Continued on Page 7)



7

SHIELDED SPRAYING of late-emerging water grass was accomplished with this combination of winged furrowing shovels and spray nozzles.

8

STRIKING evidence of the effectiveness of shielded spraying of late-emerging water grass (left—untreated; right—shield sprayed with fortified oil).

RESULTS OF 1949 SPRING MECHANIZATION TRIALS

By J. B. LARSON
Assistant Agricultural Superintendent, and
S. S. ANDERSON
Assistant Field Superintendent, Spreckels Sugar Company

DURING the Spring of 1949 several mechanical devices and methods were used in an attempt to reduce the labor costs of thinning and hoeing of sugar beets. Trials were conducted principally in the Salinas Valley, although one grower in the Woodland District employed mechanical thinning to excellent advantage.

The actual method of mechanical thinning varied according to field conditions. Where stands of beet seedlings were excessively heavy or badly infested with weeds, the Eversman or Milton weeder was used. In the thinner and more regular stands, blocking was accomplished with Eversman, Milton or Blackwelder (experimental chemical spray) blockers. In some of the mechanically weeded or blocked trials, hand work was used to accomplish the final thinned stand.

It must be emphasized that the success of mechanical methods rested heavily on the judgment used in selecting equipment, methods, and timing.

In order to evaluate the efficiency of these various devices, a number of plots were harvested both by hand and by machine.

HAND HARVEST PROCEDURE

Two beds or four rows which had been thinned by a mechanical means, and two beds or four rows thinned by hand were selected adjacent to each other. Five fifty foot lengths were measured at random throughout the field. The beets were topped and placed on the beds. The non-marketable beets (less than 1 inch in diameter) were picked out and counted then discarded and the marketable beets were counted and hand weighed. Two sugar samples consisting of ten beets were taken from each replication.

MACHINE HARVEST PROCEDURE

Two beds or four rows which had been thinned by a mechanical means, and two beds or four rows thinned by hand were selected adjacent to each other. The entire length of the beds was harvested by machine. At the beet receiving station ten sugar samples were taken from each load.

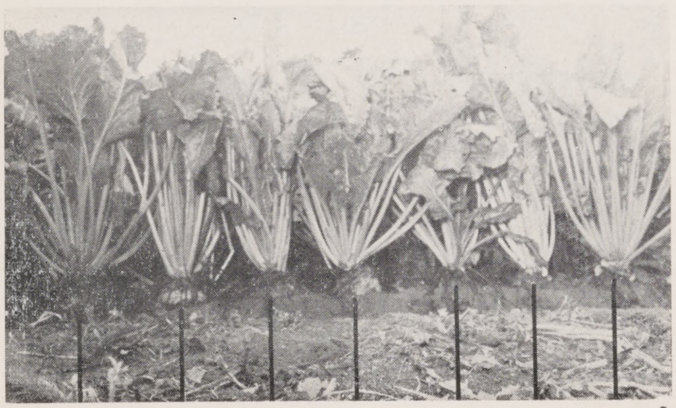
ANALYSIS OF RESULTS

A worthwhile evaluation of these experiments can be made only if the actual dollar value of the harvested crop is examined. Therefore, a table has been prepared which compares the gross dollar value of each plot. (See top of page 7). **Interested growers should view the table in terms of their own individual thinning cost experiences.**

CONCLUSIONS

After observing the mechanical devices used in these plots the following recommendations are offered:

1. Beds should be rolled before using a mechanical thinning device. The more uniform the bed the more accurate the machine will work.
2. Beet stands planted with precision planters offer more possibility of obtaining good results with stand reducers.
3. Stands that have over 1000 plants per 100 feet or row are difficult to thin mechanically. These can be reduced by going over several times with mechanical finger weeder, but the thinned stands are not uniform, and contain many multiple beets.
4. Seedling stands that range from 300 to 800 beets per 100 feet of row offer better possibilities in reducing costs of hand labor.
5. The Eversman weeder-blocker is power take-off driven so the weeder head may travel faster than the ground speed. The weeder works best in uniform heavy stands of small beets. If the operator goes too fast, there is a dragging action that could completely remove the stand.
6. The Milton weeder-blocker does its best work when the soil is friable, the beds are smooth and when the beets are in about the 4-leaf stage. It is convenient to set up, and is adjustable over a wide range of block widths and centers, but requires considerable judgement (or experimenting) to obtain best results.
7. The Blackwelder Spray Blocker tends to leave the greatest number of single plants, and has the important advantage of not disturbing the soil. It is still experimental, but holds much promise.



9

THIS IS AN example of expert hand thinning—the sort of job that insures maximum yields. (Black lines indicate centers of beets.)

10

THIS IS AN example of average mechanical thinning. While no worse than some hand work, the irregularity may cause some reduction in yield.

TABULATED RESULTS OF 1949 SPRING MECHANIZATION TRIALS

HAND HARVESTED PLOTS

LOCATION	MACHINE MAKE	TOOL	TONS BEETS PER ACRE	PERCENT SUCROSE	TONS SUGAR PER ACRE	VALUE OF BEETS PER ACRE
King City	Eversman	Disc—Approx. 8" centers	24.727	16.891	4.176	$316.09
	Hand Thinned	Check	25.848	15.595	4.030	303.54
Greenfield	Eversman	Disc—Approx. 5" centers	24.025	17.522	4.209	$319.24
	Hand Thinned	Check	27.776	17.776	4.920	374.95
Soledad	Eversman	Disc—Approx. 5" centers	16.838	14.303	2.399	$180.27
	Hand Thinned	Check	20.105	14.031	2.820	210.97
Greenfield	Milton	Knives—Approx. 4" centers	26.221	16.952	4.450	$336.22
	Hand Thinned	Check	28.560	16.476	4.714	355.73
Greenfield	Milton	1¼" Blocker— Approx. 4" centers	25.280	15.076	3.808	$286.34
	Milton & Hand Trimmed	1¼" Blocker— Plus Hand Trimming	28.377	15.411	4.370	328.90
	Hand Thinned	Check	30.272	14.987	4.536	340.82
King City	Eversman	Wire Brush	27.900	16.939	4.725	$357.56
	Eversman	Disc—Approx. 5" centers	22.830	16.766	3.827	289.37
	Eversman	1" Square Finger— Approx. 1½" centers	28.044	15.608	4.377	329.51
	Eversman	⅝" Square Finger— Approx. 2" centers	18.243	15.776	2.878	216.90
	Hand Thinned	Check	26.332	16.675	4.390	332.20
Woodland	Milton	1½" Blocks—9" centers	21.9	17.84	3.790	$296.71
	Hand Thinned	Check	21.9	16.95	3.675	280.81
Average of All Hand Harvested Plots	All Machines	All Tools	23.789	16.203	3.872	$296.10
	Hand Thinned	All Checks	26.482	15.923	4.235	314.15

MARBEET HARVESTED PLOTS

LOCATION	MACHINE MAKE	TOOL	TONS BEETS PER ACRE	PERCENT SUCROSE	TONS SUGAR PER ACRE	VALUE OF BEETS PER ACRE
King City	Milton	Weeder	Average of 5 Replications		3.323	$250.25
	Blackwelder	Spray	" " " "		3.422	250.40
	Hand		" " " "		3.708	278.71
Spreckels	Milton	Weeder	" " " "		2.819	$233.06
	Blackwelder	Spray	" " " "		2.282	189.62
	Hand		" " " "		2.906	240.15
Greenfield	Milton	1¼" Blocker— Approx. 4" centers	26.037	16.947	4.412	$333.86
	Milton	1¼" Blocker— Plus Hand Trimming	25.643	16.541	4.241	320.40
	Hand	Check	30.134	15.685	4.726	355.92

MODERN SEED

(Continued from Page 2)

These tables were taken from Spreckels Sugar Company records.

I

COMPARISON OF VARIETAL PERFORMANCE WHEN CURLY TOP IS NOT A FACTOR AFFECTING YIELD

VARIETY	1932-1935 Tons Sugar/Acre	1936-1940 Tons Sugar/Acre	1941-1947 Tons Sugar/Acre
Old Type	4.49	5.18	3.05
Domestic Varieties*	3.73	5.03	3.20
LSD 5%	0.57	NSD	NSD

*1941-1947: U.S. 15

II

COMPARISON OF VARIETAL PERFORMANCE UNDER SEVERE CURLY TOP CONDITIONS—BAKERSFIELD, 1949

VARIETY	Tons/Acre Sugar	Tons/Acre Beets	Percent Sugar	Beets Per 100 Feet of Row
US 22/3	2.74	15.9	17.2	125
US 22/2	2.58	15.1	17.2	118
US 15	0.78	4.5	17.5	61
Old Type	0.35	2.2	17.3	40
LSD 5%	0.29	2.9	NSD	12.4

Although highly productive varieties have been developed, the next few years hold the promise of new varieties that will result in better and more profitable sugar beet crops.

CONTROL OF GRASSES

(Continued from Page 4)

Other advantages that may be realized from this program are:

1. Replaces hand labor with a more dependable operation.
2. Eliminates need for working ground while wet.
3. Prevents bringing more weed seeds to soil surface during season.
4. Does not break down beds as with cultivation.
5. Aids in reducing total weed seed population in the soil.

As with any new program, if proper caution is not observed, either the chemical may fail or cause too much injury. In view of these possibilities and variations in local responses, it is suggested that only trial acreages be treated this season. In this way, the best use of the chemicals can be learned for each situation, and a good foundation will be laid for well-directed action the following year.

INSECTS AND DISEASES

(Continued from Page 3)

sprayed upon the seed to hold it on (1 to 2 pints per 100 pounds of seed). It may also be applied by means of a spray treater, of either the continuous or batch type. Lindane is supplied as 25 and 75 per cent wettable powders for seed treatment. For most sugar beet seed treatments the 75 per cent formulation is preferable, and with wet treatments can be combined with wettable fungicides, such as Arasan SF, Ceresan M, or Phygon XL. The insecticide and fungicide, are as effective in combination as when either is used separately provided the materials are fixed upon the seed with moisture or adhesives.

Storage of seed is a factor to be considered in treating seed with lindane. Until additional information regarding the effects of prolonged storage is obtained it is suggested that seed be treated only for a current season and not held to the following season. Experiments indicated that 10 to 15 months storage in jars with loosely fitting lids at room temperatures decreased wireworm effectiveness by half, and caused a delay and reduction of emergence.

Ordinarily 50 to 70 per cent of all the larger wireworms in the soil migrate to the rows during germination to feed upon the seed and seedlings. Lindane kills wireworms primarily by contact. Within a few days the wireworms become visibly affected—first becoming nervous, later sluggish, next inactive, and finally dying. Dead wireworms often appear on the surface of the soil apparently trying to escape from the chemical. Affected wireworms are not always killed immediately, but may take several weeks to die. Moribund worms do not feed, and many apparently lose their ability to orient themselves in relation to soil moisture and are desiccated and killed before they can reach adequate moisture.

In an experiment conducted with Chester Locke at Lockeford, a dosage of 4 ounces of actual lindane applied to seed gave a total mortality of 93 per cent of the worms in the seed rows and increased the stand from 0.69 plant per foot of row in the untreated rows to 1.74 plants per foot of row in the treated rows.

Trials conducted on the W. W. Wilder ranch at Woodland indicated that a seed treatment at the suggested dosages reduced the total number of wireworms in the soil by half. In the area where wireworms were abundant the number of seedlings per foot of row increased from 1.5 plants in the untreated rows to 9.2 plants in the treated rows. It was also found that many wireworms not attracted initially to the germinating seeds or small seedlings came up later to feed. These worms were affected by the lindane residue still present on the old seed balls in the ground. Although the old seed balls did not kill wireworms rapidly at this later date, they did give an additional protection to seedling establishment.

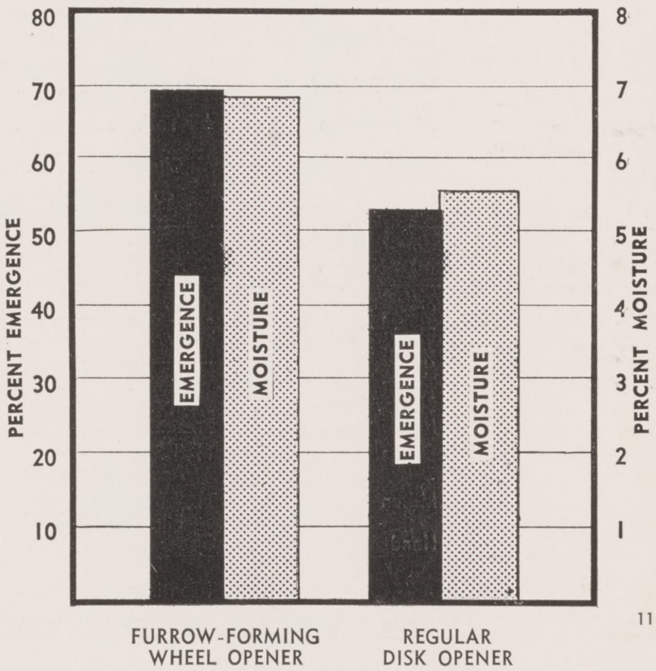
Inasmuch as a single lindane seed treatment does not affect all of the wireworms, it may be necessary to treat seed each season. There is little danger of contaminating the soil with yearly seed treatments as it would take approximately 40 years to apply a dosage by seed treatment corresponding to one used for a single soil treatment.

It is expected that these combination insecticide-fungicide seed treatments will provide an effective, safe, and relatively inexpensive means of protecting sugar beet seedlings against insect attack and seedling diseases. Growers who use such combination-treated seed will therefor provide themselves with insurance against insect and disease damage, and can look forward to uniform and adequate seedling stands from reasonable planting rates.

SOMETHING NEW

(Continued from Page 3)

planting dates, and demonstrates the correlation between percent moisture and percent germination, as well as the marked superiority of the furrow forming device.



WHEN A PLANTER was equipped with a furrow-forming wheel opener and "Squirrel Cage" press wheel, it produced a moister seed environment and correspondingly better germination than was possible with the regular disk opener and concave press wheel.

The furrow former wheel is versatile in the fact it can readily be adapted to most of the commercial planters presently in use.

The Foundation plans to distribute over 100 units of the furrow former this coming season. These will be used experimentally and will be adapted to one of the new models of commercial beet drills. These plantings will go on under various conditions of soil and moisture and it is hoped that out of it will come a planter idea which will be a benefit to the beet grower, not only in California but in all the states where sugar beets are raised.

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.
AUSTIN ARMER, Editor 600 California Fruit Bldg., Sacramento, Calif.

SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

Vol. XIV | MARCH - APRIL 1950 | No. 2

6300 POUNDS OF SUGAR IN THIS ACRE

—A record yield, but less than the average achieved by ALL growers for Spreckels Sugar Company in 1949. Contributing importantly to this record were fertilizer applications

AT THE RIGHT TIME
IN THE RIGHT AMOUNTS
IN THE RIGHT PLACE

These and other essential cultural practices are discussed in this issue.

HONEY-DEW

ANHYDROUS AMMONIA SUPPLIES NITROGEN NEEDS OF SUGAR BEETS

By ROBERT L. MOORE, JR.
Service Manager, Orchard Supply Company

ANHYDROUS AMMONIA (NH_3) as a fertilizer for sugar beets is being used on ever increasing acreages in California. The increase has followed the rapid development and perfection of equipment for applying NH_3 by injection, which has simplified the application and reduced costs to below that of most other methods of applying fertilizer materials.

NH_3 is a compound of nitrogen and hydrogen containing 82% nitrogen by weight. Under normal atmospheric pressure it is a colorless gas, but for handling it is compressed to a liquid in steel cylinders containing 150 pounds net. Recent developments have enabled the use of larger containers holding 1,730 pounds, 4,500 pounds and 6,200 pounds.

NH_3 may be applied to sugar beets before planting or as a side dressing. Rates of application vary from 100 to 160 pounds per acre as the need is indicated. This is equivalent to 82 to 131 pounds of nitrogen. Pre-planting applications may be made from several weeks ahead to the day of planting. In flat plantings, the applicator chisels are spaced from 12 to 15 inches apart and run at a depth of from 7 to 10 inches. In beds, the application is made down the center of the bed and may be made as the bed is formed or after they are completed. Application may be made in soils that range in moisture from dry to as wet as minimum workability permits. Normal coverage is from 30 to 50 acres per day. Side dressing applications may be made at the time that any nitrogen fertilizer would be applied, but the ideal time is immediately after thinning. Chisels may be run between each row or between every other with equal results. Normal coverage is from 25 to 35 acres per day.

When applied to the soil with injection equipment, the ammonia enters the soil in approximately 80% liquid form and 20% vapor, and is immediately fixed in the soil through base exchange. It remains in the soil at the point of injection and is not moved by rainfall or irrigation until nitrification takes place. Some of the ammonia is absorbed by the plant root as ammonia, particularly during early stage of growth. The balance is used by the plant as **no detrimental residue is left in the soil.** Evidence of the lasting effect of ammonia is noted in the growth and production of winter grain following crops fertilized with NH_3.

Standard application equipment consist of a rubber-tired chisel carrier with a mechanically or hydraulically lifted tool bar. A rack holds the 150-pound ammonia cylinders. Metering equipment and special rubber hoses connect the ammonia with steel tubes which run down the back of the chisel to the heel. Standard tool bars are available in widths to 15 feet and the required number of chisels may be set wherever necessary. The wheels are adjustable to fit all beet plantings.

(Continued on page 16)

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PREPLANTING of **ANHYDROUS** Ammonia (NH_3) can be combined with the listing of beds. This minimizes the cost of fertilizer application.

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SIDE DRESSING of sugar beets can be accomplished even after the plants have grown to a fair size. Soil moisture is not a factor when drilling in NH_3 gas.

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ACCURATELY SPACED chisels carry the NH_3 applicator pipes to just the right depth for proper side-dressing. Plants are not damaged, even when fairly large.

CULTURAL PRACTICES HELP TO COMBAT CURLY TOP

By N. K. GROEFSEMA
Field Superintendent, Spreckels Sugar Company

Varieties of sugar beets resistant to Curly Top have been in use for so many years that many of us have fallen into the belief that Curly Top is no longer a concern of the beet grower. We must, therefore, remind ourselves that varietal resistance alone will not completely eliminate Curly Top as a factor in depressing sugar beet yields.

Beet Leafhoppers (Eutettix tenellus) still make their annual Spring flights from their breeding grounds to the beet growing areas. Spring flights arrive in the sugar beet fields of the southern and central San Joaquin Valley from mid April to early May; about a week later in the fields of the northern San Joaquin; and about a month later in the San Joaquin Delta and in the Sacramento Valley. The upper Salinas Valley has flight dates similar to those of the San Joaquin. Their feeding upon the beet plants injects the virus causing Curly Top. Their numbers have been vastly reduced by the vigorous control program maintained jointly by the sugar processors and the State, but they remain a threat to maximum yield unless all precautionary measures are maintained.

In addition to the basic control measures (resistant varieties and reduction of leafhopper population), there are several specific cultural practices which have a direct bearing on Curly Top attack. While all of these practices could be lumped together under the general title of "Good Farming," they contribute so directly to Curly Top resistance that they deserve individual emphasis. Therefore, an outline of proper cultural practices is given below.

1. EARLY PLANTING. The present varieties should be planted in January and February, weather permitting, so that the plants will have **at least** a week or two to recover from the setback they receive at thinning time. They will then be growing vigorously when and if a flight of leafhoppers attacks the field.
2. THINNING. Delayed thinning means that each plant is competing with many neighbor plants and weeds for essential plant nutrients and moisture, thereby reducing its hardiness and Curly Top resistance.
3. HOEING. In addition to the factor of competition that the beets have with weeds for nutrients and moisture, a few of the common weeds are also hosts for the leafhoppers. Keep weeds hoed!
4. CULTIVATION. If the sugar beet must compete with weeds and grasses for essential plant food and moisture, its resistance to the virus will be reduced.
5. FERTILIZATION. A strong, healthy plant with abundant plant food has a much better chance to withstand an attack of virus than a weak plant in need of nutrients. Nitrogen is the basic nutrient contributing to Curly Top resistance.
6. IRRIGATION. In areas where the leafhopper is active, special care must be taken that the plants have abundant moisture at all times throughout the growing season. When beets suffer from lack of water, even when not visibly wilted, they become more susceptible to virus infection.

All of the above practices help to prevent the sugar beet from suffering at any stage in the growing season; especially in the earlier months. Steady, rapid growth is essential, not only to maximum Curly Top resistance, but also to maximum production of sugar per acre. It is therefore evident that all of the cultural practices which eliminate the danger of Curly Top likewise contribute to high tonnage and good sugar content in their own right.

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Striking evidence of varietal resistance to Curly Top is shown in this plot. Photographed in 1941 at Buhl, Idaho, each four-row strip reveals its relative resistance to the virus. (Left to right: R & G Old Type, U. S. 1, U. S. 33, U. S. 12, U. S. 22, Improved U. S. 22) Good cultural practices which maintain uninterrupted, vigorous growth can greatly assist the varietal resistance in eliminating dangers from Curly Top.

The Honor Roll for 1949

Grower	Acres Harvested	Tons Beets Per Acre	Lbs. Sugar Per Acre
Trafton, H F & Son	11.2	41.94	13,747
Willoughby, F. D. & Son	16.5	40.17	12,484
Tidd, R V	20.3	38.98	13,090
Christensen, Harold	21.3	38.32	12,249
Resetar, Mitchell Sr	85.6	38.29	13,570
Kane, Gene & Co.	42.2	38.02	11,362
Hahn & Lider	10.0	37.74	12,107
Jacob Bros.	44.7	37.11	12,512
Petersen Bros.	19.7	36.20	12,859
Breschini, Peter & Arnold	20.4	36.20	11,808
Christenson & Gill	50.0	36.18	10,398
Fagundes, A. D.	20.0	35.59	11,595
Aoki, Y.	10.0	35.57	11,183
Da Rosa, M. G.	52.0	35.34	11,572
Sanchez, Tom & Tony	34.0	35.04	11,500
Kamimoto, K.	15.0	34.97	12,946
Corda, Bob & John	28.0	34.63	11,422
Mahan, G. V.	10.0	34.61	12,591
Resetar, P. M. & Co.	18.4	34.59	11,455
Rasmussen, John	13.6	34.59	11,008
Travers, F. S.	22.1	34.25	11,528
Harlan & Dumars	50.0	33.86	8,099
Gibson Bros.	9.0	33.79	12,994
Porter, Thos. B.	48.4	33.36	10,516
Lind Bros.	16.0	33.22	10,923
Juhler, E. M.	9.7	33.06	11,485
Jensen Bros.	14.0	32.91	12,862
Tamagni Bros.	50.6	32.59	10,884
Resetar, P. M. & Co.	10.0	32.51	12,009
Stephenson, W. R. Sr. & Jr.	17.6	32.41	12,226
Bellone & Del Chiaro	29.8	32.41	10,722
Corda, Bob Jr. & John	21.0	31.97	11,733
Jarvis, J. P.	33.0	31.97	11,240
Abeloe, E. H.	27.0	31.93	11,317
Darsie & Beck	140.0	31.91	9,228
Church, Sidney L.	21.5	31.91	9,694
Ikeda, Sam	18.0	31.90	10,489
Salmina Bros.	18.0	31.89	9,993
Gibson Bros.	16.0	31.82	13,287
Storm & Farrell	45.0	31.40	10,915
Vosti, A.	28.0	31.38	9,652
Storm & Farrell	50.0	31.37	10,473
Scattini, Luis	13.4	31.17	9,352
Resetar, P. M. & Co.	10.0	31.16	11,099
Bacciarini, T. G.	40.7	31.07	9,656
Kamimoto, K.	25.0	31.06	11,642
Vanetti, John	36.0	31.02	9,387
Martella Bros.	41.5	31.01	9,434
Arcotti Bros.	22.8	30.80	10,243
Closter, Paul N.	28.0	30.79	10,978
Holthouse, T. H.	50.0	30.78	9,771

Grower	Acres Harvested	Tons Beets Per Acre	Lbs. Sugar Per Acre
Tavernetti Ranch	18.2	30.71	9,802
Bruce Church, Inc.	40.8	30.65	10,321
Locke, Chester M.	36.0	30.51	9,000
Scagliotti, Joe	45.0	30.51	10,042
Russell, H. C.	180.0	30.50	10,047
Nutting, Mary & E. E.	111.0	30.44	10,739
Borges, Frank C.	38.2	30.42	11,811
Paulsen, Paul D.	30.5	30.30	9,610
Craddock, M. O.	14.4	30.22	9,150
Petz, Dewayne	60.0	30.17	10,849
Wood, R. G.	55.7	30.13	10,239
Warner, Floyd	30.0	30.00	10,758
Chung, T. W.	55.9	29.98	9,904
Mortensen, C. & A.	22.3	29.96	10,583
Olson, E. M.	100.0	29.94	10,850
Morisoli, Arnold	11.1	29.86	9,232
Breschini, Peter & Arnold	6.3	29.75	10,393
Silveira & Wyman	40.0	29.68	9,570
Righetti, Elmer	16.0	29.67	11,567
Harlan, Robert	29.0	29.67	11,214
Hayes, J. H.	35.3	29.55	9,478
Silva, Manuel	119.3	29.51	9,332
Miyanaga, Tom	9.5	29.48	10,393
Adams, J. P. & Son	21.1	29.46	10,576
Petersen Bros.	19.7	29.38	10,083
Farley Fruit Co.	18.0	29.38	9,990
Lowrie, Geo. P.	57.3	29.37	9,793
Ice Kist Packing Co.	12.0	29.36	9,736
Signorotti, Pete & Son	7.0	29.34	9,839
Vogt, C. N.	157.0	29.32	9,969
Strobel Bros.	33.9	29.24	10,258
Gambetta, Joe P.	27.5	29.19	9,044
California Packing Corp.	45.0	29.17	9,492
Dyer, Frank	11.0	29.12	9,842
Brown & L. W. Land Co.	30.8	29.11	9,741
Herbert, Garnet W.	50.9	29.08	9,630
Hitchcock Bros.	49.0	29.04	10,101
Scagliotti, Joe	16.0	29.03	9,900
Christensen, W. M.	22.0	29.02	9,924
Renz, R. A.	29.0	28.98	10,091
Jensen, N.	13.5	28.96	10,397
Farley Fruit Co.	20.0	28.96	9,660
Gomes, Elmer & Frank	25.0	28.93	10,399
Church & Hughes	33.8	28.92	8,802
Lowe, W. K.	60.0	28.85	8,811
Reed, Michael K.	47.0	28.85	9,046
Black, Bennie S.	40.8	28.84	10,139
Bruce Church Inc.	15.0	28.79	9,016
Migotti, Walter	15.2	28.76	9,515
Lueddeke, Gus & Jeanne	17.0	28.70	10,403
Hitchcock Bros.	36.3	28.58	10,522

THESE ARE SPRECKELS GROWERS WHOSE CONTRACTS YIELDED 25 OR MORE TONS PER ACRE—NOT MERELY ON A FEW SELECTED ACRES BUT ON MAJOR CONTRACTS WHICH ADD UP TO 16.3% OF ALL SPRECKELS ACREAGE FOR 1949. THAT THIS LIST INCLUDES MORE NAMES THAN EVER BEFORE DOES NOT LESSEN THE DISTINCTION OF ACHIEVING A PLACE ON THE HONOR ROLL. SPRECKELS SUGAR COMPANY CONGRATULATES YOU!

Grower	Acres Harvested	Tons Beets Per Acre	Lbs. Sugar Per Acre
Darsie & Gamble	12.0	28.57	9,651
Carando & Button	30.0	28.55	9,821
Farley Fruit Co.	47.8	28.51	9,363
Breen, John R. & James P.	75.0	28.49	10,839
Taix Company	31.0	28.42	10,028
Olson, E. M.	185.0	28.38	9,723
Danini Bros.	37.5	28.31	10,235
Johansen, N. P.	10.0	28.28	9,350
Scattini, Luis	50.0	28.28	8,948
Farley Fruit Co.	43.1	28.13	9,661
Oreggia, John & Co.	55.0	28.13	9,306
Cotta, Frank	21.0	28.12	10,597
Massera, Al	8.3	28.12	9,881
Mendonca, Toney	50.0	28.11	9,916
Scattini, Vincent	25.0	28.10	9,862
Schween Bros.	40.0	28.07	9,033
Fanoe Bros. & Sons	153.2	27.97	10,362
Abeloe, James P. S. & Sons	28.3	27.92	9,008
Bassi, Paul E.	18.0	27.88	9,139
Fallati & Co.	25.0	27.86	9,144
Del Piero, Timo	18.2	27.86	8,865
Fulmor, J. N.	53.0	27.80	9,024
Manzoni, Art	27.4	27.76	9,251
Huber, Joe	35.0	27.73	8,607
Garcia & Battinich	4.0	27.72	10,113
Ice Kist Packing Co.	176.8	27.70	9,219
Sanchez, Sig, Marion & Joseph	50.0	27.69	8,955
Dixon, Philip	65.0	27.60	8,219
Odermatt, Paul F.	26.0	27.60	8,296
Schween Bros.	22.2	27.59	9,931
Shiratsuki, S.	31.9	27.59	9,618
Breen, John P.	24.0	27.50	10,862
Collier, A.	16.0	27.44	8,506
Campi, M.	34.0	27.39	7,368
Corda, Bob Jr. & John	20.0	27.38	11,067
Swanston, C. & Son	69.0	27.36	8,832
Jensen Bros.	65.3	27.34	8,601
Storm & Farrell	58.6	27.26	9,957
Martin Bros.	36.0	27.24	9,370
Stolich, Peter A. & Co.	34.4	27.21	7,739
Hart, E. J.	78.7	27.18	9,795
Furtado, M. & Son	36.0	27.18	9,547
Best, Dan G.	160.0	27.17	8,977
Backer & Backer	26.0	27.12	9,324
Juhler, Robert	5.0	27.09	10,045
Embrey & Neal	60.0	27.09	9,429
Weyand, W. J.	214.0	26.93	9,016
Righetti, Elmer	6.0	26.79	10,061
Dolan, James P.	31.3	26.78	10,010
James, Barry	9.0	26.70	8,517

Grower	Acres Harvested	Tons Beets Per Acre	Lbs. Sugar Per Acre
Thomas, M. H. & W. F.	46.0	26.68	7,785
Forden & Becker	362.0	26.47	8,259
Ramseier & Kenney	74.6	26.47	9,641
Rosa, Wilbert	7.0	26.46	8,721
Fong, Donald	36.0	26.35	8,701
Giottonini, F. & W.	15.0	26.33	10,085
Wynne, Roy	55.0	26.32	8,733
Steidley & Uyeno	41.5	26.20	8,514
Foster & Hutchings	14.0	26.18	8,738
Moore, Richard	44.0	26.17	7,694
Taix Company	173.5	26.15	8,994
Green, Joe Jr.	50.0	26.09	8,166
Ice Kist Packing Co.	47.0	26.08	7,969
Nishimoto, T. R.	7.0	26.05	10,606
Verzasconi, L.	18.9	26.03	9,239
Malcolm, R. F. Jr.	52.0	26.00	8,242
Craddock, M. O.	13.8	25.99	8,906
Franscioni & Griva	62.1	25.97	8,663
Martin Bros.	22.0	25.89	8,456
Forden & Becker	66.0	25.86	8,322
Vincenz Bros.	50.0	25.84	9,146
Jefferson, Walter	55.4	25.78	9,507
Nutting, Mary F. & E. E.	29.0	25.74	8,737
Russell, E. J.	37.2	25.73	8,563
Heidrick Bros.	40.0	25.71	7,903
Bertuccio, Paul Wm.	32.9	25.64	10,501
Porter, Thos. B.	30.2	25.62	8,485
Chesholm Farms, Thos.	108.8	25.62	8,397
Hahn & Lider	45.0	25.53	8,256
Nutting, Mary F. & E. E.	36.0	25.52	9,199
Pollock, Ralph W.	138.0	25.52	8,360
Lanini Bros.	5.8	25.50	9,542
Warner, Floyd	90.0	25.45	9,070
Struve, George M.	425.0	25.45	8,093
Hahn & Lider	45.0	25.41	8,512
Braden, J. H.	38.0	25.40	8,915
Collier, A.	70.0	25.38	8,304
Graffigna, John	145.0	25.38	7,111
Clark & Romans	63.3	25.36	8,180
Warner, Floyd	35.0	25.35	8,710
Himmah, Arthur T.	40.7	25.29	8,188
Petit, J. A.	20.3	25.24	8,878
Guidotti, C.	21.5	25.20	7,783
Trafton & Stephenson	35.6	25.17	9,903
Heidrick Bros.	90.0	25.10	8,454
Green, Joe Jr.	80.0	25.07	7,656
Vanetti, John	29.0	25.07	8,539
Darsie & Beck	40.0	25.06	9,032
Silveira, Manuel F.	130.0	25.04	9,013
California Packing Corp.	66.0	25.03	8,250

HARVESTING SMALL SUGAR BEET ACREAGES AT LOW COST

By E. F. BLACKWELDER
Manager, Blackwelder Manufacturing Company


18

JUST ONE YEAR ago there appeared in these pages an article entitled "The 1948 Harvest in Review." I quote from this article: "Our harvest is not 100% mechanized. But in reality, it's about as completely mechanized as it is likely to become unless a method is developed to harvest the smaller acreages economically by machine."

We of the Blackwelder Manufacturing Company accepted this challenge, and now offer the means to harvest the smaller acreages economically by machine. We have been working for three years on the design of a low cost, light weight beet harvester. We set our sights a bit higher than they were when the big two-row machine was designed. The new machine would not only have to meet the requirements of low cost and light weight, but would have to do a cleaner and more accurate topping job; would have to recover a higher percentage of beets, and break fewer beets.

Several models were made, field tested throughout the United States, and rejected because they did not perform up to the new standards of quality. But each failure suggested an improvement, and early in 1949, the new machines were ready for field trials. The new model was christened Marbeet Midget.

HOW THE MARBEET MIDGET WAS DEVELOPED

Low cost and light weight were achieved by mounting the harvester elements on a conventional wheel tractor. This step eliminated the ground wheels and main frame which amount to about half the weight of any tractor-drawn machine.

Cleaner topping was accomplished by oppositely rotating overlapping disks. These self-sharpening disks slice the beets with a clean, square cut. The required depth of cut is determined by strippers which lift the beets partly off the spikes just as they approach the sharp disks.

Better recovery and reduced beet breakage were accomplished by a complex of plow design, spike wheel location and method of drive. The feature which puzzles everyone, including our own engineers, is how the little 30-inch spike wheel can do a better pick-up job than the old 6-foot wheels. But it does, beyond a doubt.

WHAT THE MARBEET MIDGET WILL DO

Records were kept of all the Marbeet Midget trials in 1949. Daily tonnage ranged from 40 to 112, with an average close to 70 tons per day in beets yielding 20 tons per acre. Thus the daily capacity may safely be rated at $3\frac{1}{2}$ acres per day.

The Midget will accommodate all evenly spaced row spacings from 18 to 34 inches. It will fit on the leading makes of large four wheel tractors with rear power takeoff. The following table lists the row spacings and tractors which will accommodate the Midget:

Farmall Model "H" Allis-Chalmers "WD"	Farmalls "M" & "MD"	John Deere "AW" & "GW"
18	18	18
20	20	20
22	22	22
24	24	24
*26	26	26
28	28	28
30	30	30
32	32	32
34	34	34

*Farmall "H" should have 100" axle on left rear for this spacing

NOTE: Spacings underlined mean that wheels do not fit center of row.

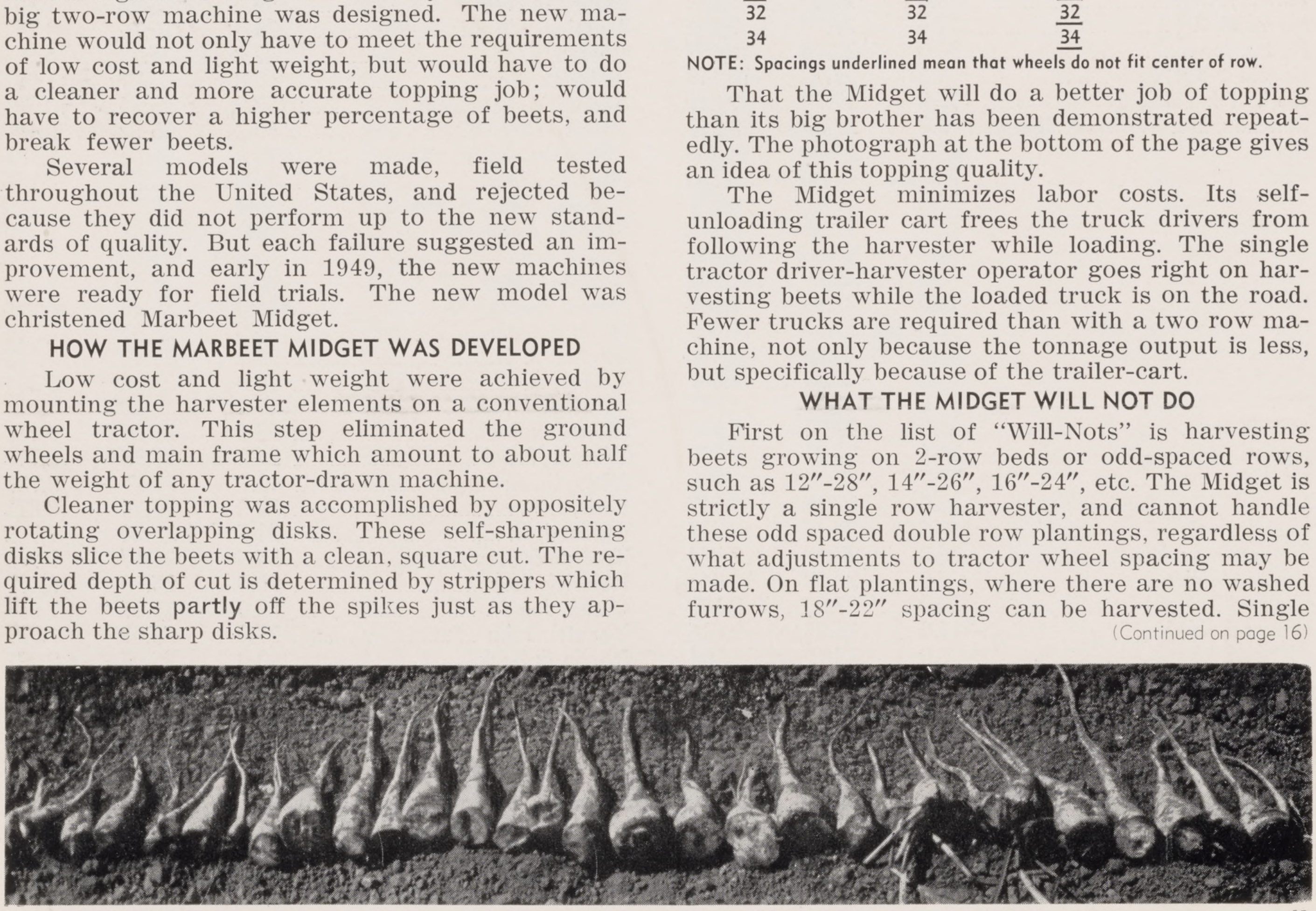
That the Midget will do a better job of topping than its big brother has been demonstrated repeatedly. The photograph at the bottom of the page gives an idea of this topping quality.

The Midget minimizes labor costs. Its self-unloading trailer cart frees the truck drivers from following the harvester while loading. The single tractor driver-harvester operator goes right on harvesting beets while the loaded truck is on the road. Fewer trucks are required than with a two row machine, not only because the tonnage output is less, but specifically because of the trailer-cart.

WHAT THE MIDGET WILL NOT DO

First on the list of "Will-Nots" is harvesting beets growing on 2-row beds or odd-spaced rows, such as 12"-28", 14"-26", 16"-24", etc. The Midget is strictly a single row harvester, and cannot handle these odd spaced double row plantings, regardless of what adjustments to tractor wheel spacing may be made. On flat plantings, where there are no washed furrows, 18"-22" spacing can be harvested. Single

(Continued on page 16)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THESE BEETS were collected consecutively as they left the Midget's topping disks. Large or small, each was topped with relative accuracy.

20

THE MIDGET mounted on a Farmall M. This picture was taken the day after it harvested 112 tons in a field yielding 19 tons per acre.

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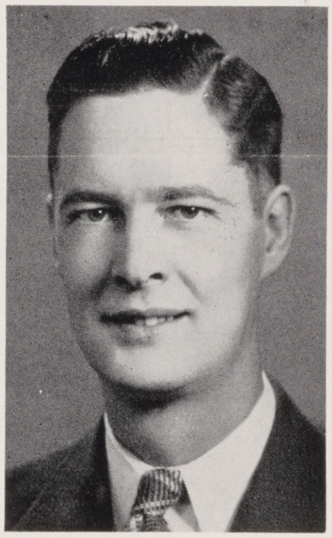
WHEN THE trailer cart is filled, the truck pulls alongside and receives a ton and a half of beets in about 40 seconds operation of the elevator.

PLANT BREEDER JOINS SPRECKELS AGRICULTURAL STAFF

DR. RUSSELL T. JOHNSON, geneticist, plant breeder and plant pathologist, will head the Spreckels Sugar Company beet seed improvement program. Born and reared in Brigham City, Utah, an area in which a large acreage of sugar beets is grown. Dr. Johnson graduated from the Utah State Agricultural College in Logan, Utah, with a B.S. degree in Soils and Agronomy.



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From 1938 to 1942 he produced and sold hybrid seed corn in the state of Utah. In 1940 he accepted employment with the Production and Marketing Administration of the United States Department of Agriculture in the administrative capacity of supervising field employees throughout the state of Utah. In August, 1942, he enlisted in the United States Marine Corps in which he served until May, 1946. After leaving the service he returned to his former position with the United States Department of Agriculture for a short time.

In September, 1946, he entered the graduate school of the University of Minnesota for the purpose of obtaining a Ph.D. degree with a major in Plant Genetics and a minor in Plant Pathology, and in 1950 he was granted his Ph.D. degree.

In order to make the most of Dr. Johnson's talents, all facilities of the Spreckels Plant Breeding Farm will be placed at his disposal. The many strains of beet seed on hand will form the basis for a breeding and selection program aimed at increased yields and sucrose percentage, together with improved resistance to bolting, mildew and curly top.

Dr. Johnson's work will be directed toward the specific problems of Spreckels growers. His background of genetics and plant pathology will add much to the Spreckels Agricultural Department as a grower-service organization.

ANHYDROUS AMMONIA

(Continued from page 10)

The metering device utilizes a differential regulator permitting the measuring of the NH_3 through an accurate orifice with a constant pressure drop.

Tractor type applicators consist of standard cultivator tractors fitted with cradles to hold 2 or 4 cylinders. The injection chisels are attached to the tool bar and the metering equipment is mounted where it is handy for the tractor operator.

Large containers of 1,730 pounds capacity are now used by mounting the chisels and metering equipment on the tractor and towing the ammonia container with a "carryall" type trailer. The use of the larger containers enables a longer continuous run without reloading and increases the number of acres covered in a day.

NH_3 is sold on a service basis, the cylinders being delivered to the field and empties returned by the agents. The equipment is delivered, set up, and the operation supervised by experienced servicemen. There is no storage problem, since the ammonia is delivered as needed.

It has been established that the tonnage of sugar beet yields in most California soils is materially increased by added nitrogen. It has also been established that the use of NH_3 by injection is an adequate method for supplying this needed nitrogen. Therefore the injection of NH_3 can be expected to grow rapidly in its acceptance by California sugar beet growers.

HARVESTING SMALL ACREAGES

(Continued from page 14)

row beds (any row spacing from 20" to 34") present no problem, except that the tractor wheels have to run to one side of center in spacings from 26 to 34 inches.

The size of beets, in rare cases, can limit the operation of the Midget. Beets exceeding eight pounds in weight are too large to handle without either breakage or plugging. (Hardly a serious fault, since a 100% stand of eight pound beets would yield 105 tons to the acre!)

Last on the list of "Will-Nots" is harvesting large daily acreages or tonnages. To the grower accustomed to harvesting ten acres a day with the big Marbeet (or a 50-man hand crew), the Midget's 3½ acre daily output may seem small. But to the man with 50 to 100 acres to harvest in a season, or the man with a 50-ton-per-day delivery quota, the Midget's modest capacity can be a blessing.

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.

Editor
AUSTIN ARMER
600 California Fruit Bldg.
Sacramento, Calif.

SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

Vol. XIV MAY-JUNE 1950 No. 3

GREETINGS TO SPRECKELS SUGAR COMPANY GROWERS FROM PRESIDENT ABBOTT OF AMERICAN SUGAR

The American Sugar Refining Company

New York

OFFICE OF THE PRESIDENT

March 16, 1950

A Message to the Men Who Grow Beets
for Spreckels Sugar:

Now that we are taking a more active part in the management of Spreckels Sugar Company, I want you to know that we are keenly aware of the essential role which you play in making it possible for that company to operate and prosper.

As you probably know, the American Sugar Refining Company has owned fifty per cent of the stock of Spreckels Sugar Company for more than fifty years. We have recently obtained control by buying a majority of the capital stock of Spreckels Companies, which owns the other half of the stock of Spreckels Sugar Company.

It will be our policy to work with the management and personnel of Spreckels Sugar Company in fostering even more cooperative, pleasant relations between Spreckels Sugar Company and its growers.

A particularly promising future seems to lie ahead of the beet sugar industry in the great Pacific Coast area. We naturally want Spreckels Sugar Company and its growers to take a leading part in the development of this industry, -- on a mutually advantageous basis. We invite your close cooperation to this end.

I hope that we will merit your good will and friendship.

Cordially yours

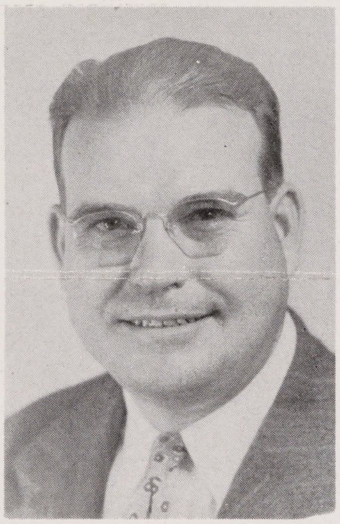
J S Abbott

President

BASIC CONSIDERATIONS IN IRRIGATION OF ROW CROPS

By L. J. BOOHER
Extension Specialist in Irrigation, University of California

As THE summer irrigation season approaches, many farmers are taking inventory of their irrigation practices to see if improvements can be made. An analysis of the irrigation problems on any farm should take into consideration four factors. These factors are soil, slope, length of runs and water supply.



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SOIL

The soil is the reservoir which stores the water used by plants. A readily available supply of moisture should be maintained in the soil mass normally occupied by the roots of plants at all times during the growing season.

The upper limit of readily available soil moisture is known as the field capacity. This is the amount of water retained in the wetted portions of a well drained soil following an irrigation. The moisture content of the soil below which plants cannot readily obtain water is known as the permanent wilting percentage. The amount of available moisture which a soil will hold varies for each type of soil. In general, a clay soil will store 2 to 2½ inches, a loam soil will store 1 to 2 inches, and a sandy soil will store ½ to 1 inch of available water in each foot depth of soil.

Moisture will move through the soil in appreciable amounts only when the soil moisture is above the field capacity. This occurs when the soil is saturated or when there is a free water table. When water is being applied in a furrow the soil immediately beneath the furrow becomes saturated. This water moves downward due to the force of gravity, and also moves horizontally, upward or in any other direction to where there is dry soil due to capillary attraction. This capillary movement of water is sometimes referred to by farmers as "subbing."

When the downward movement of water is obstructed by an impervious layer, the soil above this layer becomes saturated and the water moves readily into the dry soil between the furrows. For this reason a soil that subs well is a soil in which it is usually difficult to obtain deep penetration. A soil that drains rapidly will not sub well. Fig. 1 indicates the manner in which water moves from furrows to root zones.

The moisture in a soil at field capacity, however, is practically stationary. Water will be lost from the top few inches of soil by evaporation, but the re-

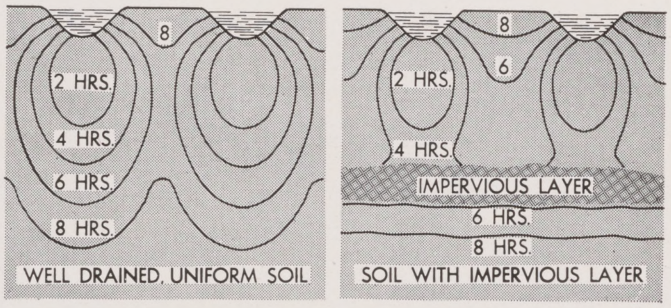

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Fig. 1 Movement of water into soils at different periods during an irrigation.

mainder of the available moisture can only be removed by the roots of plants. Since the water will not move to the roots, the roots must grow to the available moisture. Roots will not extend into a dry soil. When the irrigation water does not penetrate to the depth of rooting (sugar beets will extend their roots to a depth of 5 to 6 feet) or sub across from furrow to furrow, efficient use is not made of the soil.

Inability to obtain sufficient water penetration is a problem on many farms. The causes of poor water penetration can generally be attributed to destruction of soil structure through excessive cultivation or by compaction of the soil by farm implements; to lack of proper land preparation for irrigation; to poor management of the irrigation water; or to dispersion of the soil particles by undesirable salts which may be present in the soil or irrigation water. In some cases the soils are by nature of such fine texture or have such a high density that the free movement of water into the soil is inhibited.

It is desirable to start the growing season with the soil wet to field capacity to the full depth of rooting that can be expected for the mature plant. This permits a rapid development of the root system during the early stages of growth.

The amount of water to be applied at each irrigation should be sufficient to wet the entire root zone to its field capacity. The depth of water required to replenish the soil moisture will depend upon the type of soil and the moisture condition of the soil at the time of irrigation. Irrigations should be applied before the soil has reached the permanent wilting percentage in the major portion of the root zone. As previously indicated, all the moisture in the soil above the permanent wilting percentage which is in contact with roots is readily available to plants.

SLOPE

The slope of the furrows down which the water moves while irrigating is one of the most important factors in row crop irrigation. If the slope is too steep, the water moves with a high velocity resulting in inadequate penetration of the water and often causing erosion of the beds. If the slope is not uniform, the water will pond in the flatter areas and run too fast in the steeper ones, preventing a uniform penetration of the water.

Farmers generally prefer relatively flat slopes for furrow irrigation. Slopes of 0.1 to 0.2 foot per 100 feet are often used. With these flat slopes, relatively large heads of water can be used in each furrow without causing erosion, and better movement

of water into the soil between the furrows can be obtained.

The slope can often be improved by changing the direction of the irrigation runs. This may necessitate the revamping of the distribution system for the irrigation water and for this reason many farmers hesitate to make this change.

LENGTH OF RUNS

The shape of the field is often the determining factor in establishing the length of irrigation runs for each field. It is often possible to improve the uniformity of distribution of the irrigation water, however, by shortening the lengths of runs.

If the rate of water penetration into the soil is high and the furrows are too long, a large amount of water will be lost by deep percolation at the upper ends of the furrows in order to irrigate properly the lower parts of the field. In some cases two or three times the amount of water needed is used to irrigate a field because the furrows are too long. (See fig. 2.)

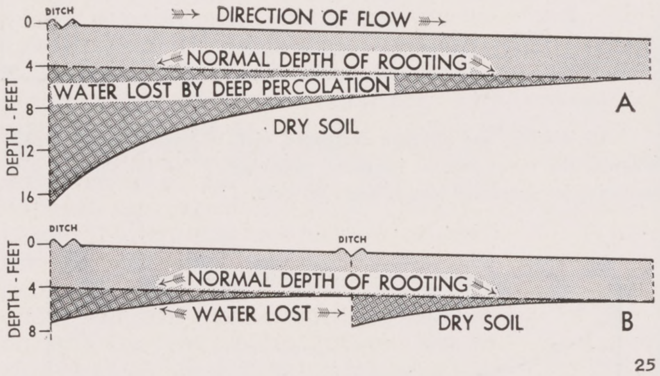


Fig. 2 Effect of length of rows on depth of water penetration.
A—Field with runs too long.
B—Field where runs have been shortened.

Many farmers have found that the cost of installing an additional head ditch half way down the field and the extra labor required to irrigate the shorter runs is more than compensated for in savings of water and increased yields.

WATER SUPPLY

In the distribution of water to row crops, the most important factor to be considered is the amount of water turned into each furrow. This is sometimes called the "unit head" of water. It is the total supply divided by the number of furrows irrigated at one time.

The farmer has more control over this factor than any of the other three factors previously discussed. The unit head can be varied by increasing or decreasing the number of furrows irrigated at any one time. Adjustments of the unit head can often be used to obtain a more uniform depth of penetration as well as to regulate the amount of water added to the soil at each irrigation.

(*Continued on Page* 22)

WATER-FERTILIZER INTER-RELATION PROVED BY FIELD EXPERIMENTS

By WILLIAM DUCKWORTH
Asst. Field Superintendent, Spreckels Sugar Company

WATER, fertilizer, stand, weeds, and disease, are major factors influencing the yield of a sugar beet crop. If sugar beet growers are to obtain maximum yields, it is necessary that all factors affecting production be taken into consideration and proper emphasis placed on each. The use of water and nitrogen fertilizers is almost universal under California conditions; therefore, these two factors probably have a more direct influence on yield than the other factors that enter into the growing of sugar beets. Previous articles in the Spreckels Sugar Beet Bulletin have shown the effect on yield of varying water and nitrogen levels, and how proper use must be made of water in order that the applied fertilizers will give the maximum returns.

To prove these facts in any single experiment is difficult, since it is seldom that conditions appear in the field which permit accurate measurement of the growth gain or loss where water and nitrogen were unevenly applied. However, one of the 1949 Spreckels Sugar Company field variety trials supplied conditions under which it was possible to analyze the harvest data for a measurement of the effect of uneven water distribution.

This variety trial was designed so that eight varieties formed a ten replication unit. Each replication consisted of 16 beds of 62 feet in length. The head of the trial was located 50 feet from the head ditch, with the remainder of the trial continuing 620 feet into the field. Fertilizer (NH_3) was applied in the water in split applications. After the first application of nitrogen a great deal of difficulty was encountered in getting adequate water penetration. As a result, the amount of water and nitrogen made available to the crop was appreciably limited. The head of this trial received greater amounts of water and nitrogen, while the amounts available to the remainder of the trial were reduced by the "sealing" of the soil. The result of this reduction in the amount of water and nitrogen is evident in the decline in yield the greater the distance from the head ditch. The yield in tons per acre declined from 19 tons at the head of the trial to 12 tons at the far end—a decrease of 7 tons in a distance of 600 feet. The percent sugar follows the typical increase due to conditions of inadequate water and nitrogen. The situation is presented in the graph which heads the next page. However, the increase in percent sugar does not compensate for the decrease in tonnage. The resulting yield of sugar per acre was reduced in proportion to the distance from the head ditch, as may be seen in the second graph on the next page.

This variety trial is but one case of uneven water distribution. It must be remembered that uneven distribution can be the result of many things, either physical or mechanical, and that whatever the cause of the water deficiency, the resulting crop will have suffered to some extent.

(*Continued on Next Page*)

There are various reasons for uneven water distribution, some of which may be unforseen or uncontrolable, as in the above case where poor penetration prevented the growing crop from receiving adequate amounts of water. However, uneven distribution of water may occur where penetration is excessive, that is, the field holding capacity is low as in the case of sand or gravel streaks. Sand or gravel streaks in an otherwise perfect field will give a striking demonstration of the effect of unequal water availability.

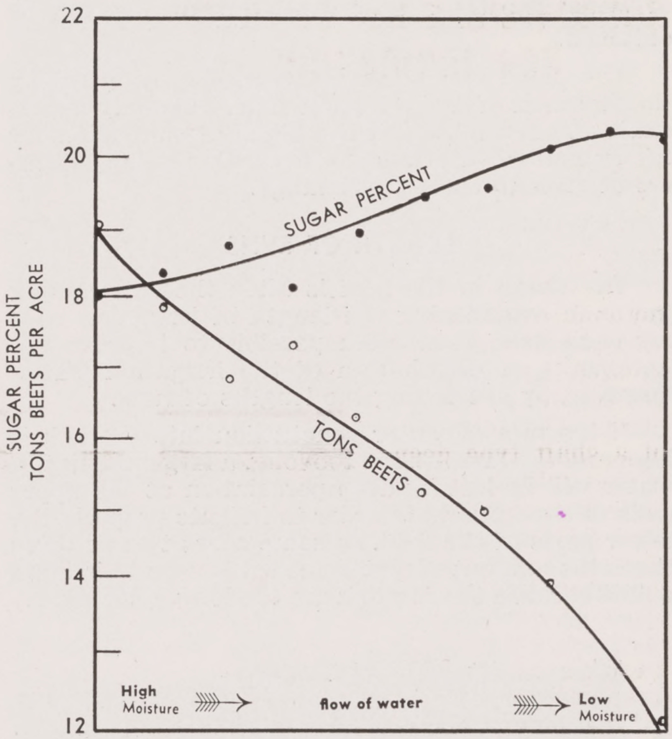
Penetration problems caused by physical characteristics of the soil are frequent in occurance, but the overall effect is small when compared to the water distribution problems caused by the purely mechanical aspects of irrigation. The common deficiencies in good irrigation practices are recognized by all, but in many cases remain uncorrected. The major cause of poor distribution is unlevel or improperly leveled land causing too fast a run-off, dry spots or flooded low spots. Lack of proper water control is another major cause of uneven distribution. Unskilled irrigators who apply too little or too much water can adversely influence the crop. Proper use of field gates, dams, and distribution devices will greatly aid the irrigator in putting the **right amount of water on the right place at the right time.**

It behooves the grower to make the very best possible use of his available water, not only by proper distribution, but by timely irrigations in adequate amounts. By use of simple tools, such as a soil tube, auger or shovel, a farmer can determine the characteristics of his own fields, and learn when he should start the next irrigation and how deep his water must penetrate.

It would be well for growers to note the six basic irrigation facts, as enumerated by F. J. Hills (Spreckels Bulletin, Vol. XII No. 3). These are:

1. Irrigation runs should not be so long that adequate penetration cannot be secured on the lower end. Generally, the sandier the soil, the shorter the irrigation runs should be.
2. Excessive penetration beyond the root zone robs the plants of valuable nutrients.
3. Roots will not grow into dry soil. A field should be wet to a depth of at least five feet early in the season so that normal root development may take place. Thereafter, irrigations need only be as heavy as is necessary to replace depleted moisture.
4. Attempting to make plants "root down" by starving them for water will decrease yields. When plants wilt, essential growth processes that increase weight and sugar content are greatly slowed down.
5. When a soil is dry, the plants suffer directly from a lack of water, and also because the formation of essential nitrates by soil microorganisms is greatly hindered.
6. Cultivation conserves moisture mainly through killing competitive weeds and has little effect in preventing evaporation of moisture from the soil surface.

An appreciation of these facts can aid in solving irrigation problems, lead to better water uses, and give greater returns from better crops.



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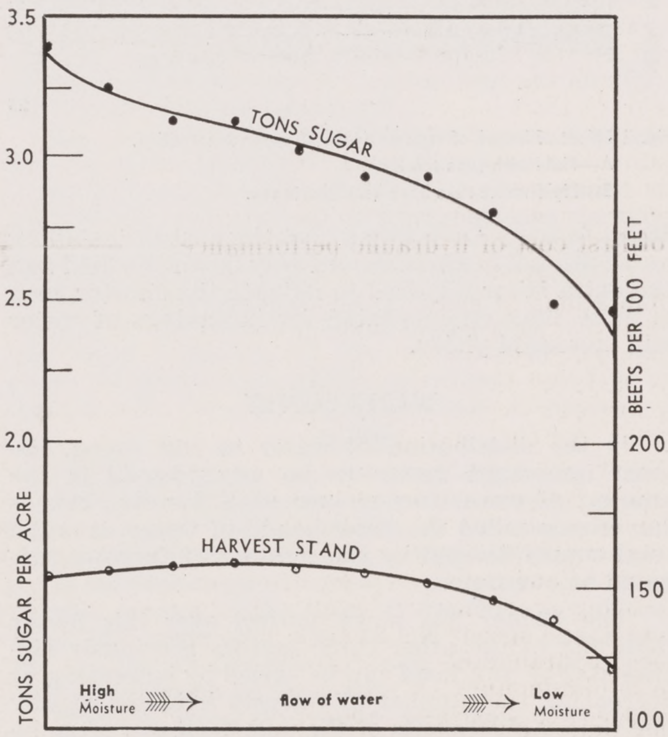
AS WATER and nitrogen decreased, yield of beets dropped rapidly. Whereas the sugar percent increased somewhat, it fell far short of compensating for decreased tons of beets per acre.



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THE YIELD of sugar per acre dropped seriously as moisture and nitrogen levels were reduced. At the extreme of low moisture and nitrogen levels, the actual stand of beets fell off, still further reducing yield.

SUBMERSIBLE MOTOR PUMPS FOR IRRIGATION

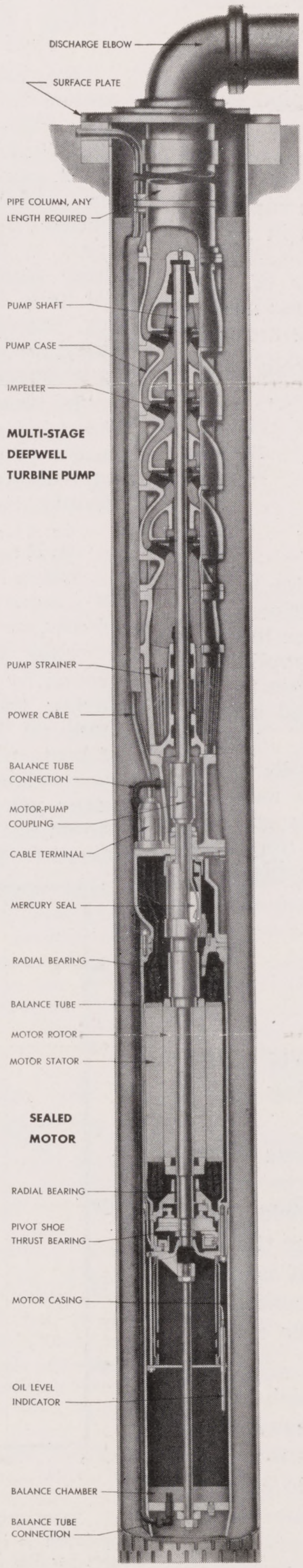
By ARNOLD "BEN" BARROW
Byron Jackson Service Company, Woodland

28

THE steadily receding water table in many areas has resulted in a high demand for a more satisfactory means of lifting water greater distances from drilled wells. The inherent characteristics of a shaft type deepwell turbine pump make it necessary that the well be straight and plumb, that the pump may hang freely. Otherwise, the shaft will whip, pounding out the bearings and causing a shutdown, usually during a critical irrigating period. Transmission of power from the driver to the pump through fifty to several hundred feet of vertical shafting, with a suspended pipe as the only means of maintaining accuracy of alignment presents obvious difficulties. The thrust imposed by this long shaft creates a bearing load that frequently requires the best in design, materials and workmanship. The drive shaft elongation under varying load conditions encountered in the well makes difficult the accurate axial adjustment of the impellers in the pump. The practical impossibility of maintaining alignment between shaft bearings has compelled the designer to limit speeds, frequently to the detriment of first cost of hydraulic performance.

The logical solution to the inherent limitations of shaft type pumps was to close-couple a submersible motor to the pump and eliminate the long drive shaft. A basically different method of deepwell pumping evolved in 1928 whereby an oil filled, mercury sealed electric motor designed for sustained operation under water was put on the market by Byron Jackson Company, originators of the first shaft type deepwell pump.

By abandoning the long drive shaft, bearing problems are practically eliminated and speeds can be such as to give best hydraulic efficiency and economy. A minimum number of moving parts are exposed to wear and crooked wells can be pumped successfully. This is very important, as many existing wells are straight for only a certain distance below the water level. When it becomes necessary to lower a pump, it is sometimes found that the well is crooked beyond a certain point and successful operation of the lineshaft pump is impossible or a source of trouble and expense.



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In the submersible motor pump the motor is mounted below the pump and the entire assembly is suspended from the surface by the column pipe. Water developed from strata below the motor flows up past it and enters the strainer, passes through the pump into the discharge column and thence to the surface of the ground where it is openly discharged or is piped into a pressure pipeline. Power is transmitted from the starter to the motor through a marine type submersible cable consisting of three stranded conductors and an oil level control wire. These conductors are enclosed with jute fillers in a lead sheath which in turn is covered with woven jute upon which is wrapped a double steel spiral armor. A final cover of woven jute is impregnated with a non-hygroscopic compound.

Construction features of the submersible motor include two major patented features: a mercury shaft seal and hydrostatic balance. The mercury seal is located in the top of the motor where its shaft extends through the motor housing and functions to isolate the well water from the oil in the motor. Essentially the seal is a rotating U tube in which water contacts the mercury on one side and the motor oil on the other side. The seal consists of an annular stationary baffle around the motor shaft with one end of the tube submerged in a mercury filled bowl which revolves with the shaft.

Hydrostatic balance is maintained between the water outside and the oil within the motor housing by a balance tube extending from the bottom of the motor into the motor shaft coupling compartment above the motor. The motor oil is circulated throughout the motor for cooling the rotor, stator windings and bearings. The oil used in the motor is similar to that used in high voltage transformers, that is, it has high dielectric strength and is non-hydroscopic. The motor is fitted with an electrode in the balance chamber and during the normal years of operation, should any of the oil be displaced by any reason whatsoever permitting water to make contact with this oil level indicator, a motor protective relay mounted in the starter panel will stop the motor before damage can be done. In the event this should ever happen, it is relatively easy

(Continued on Next Page)

and simple to pull the entire assembly for inspection as the pumps are normally furnished with random 20 foot lengths of column pipe. Much time is saved by not having to unscrew shafting and oil tubing and re-assemble. The armored submarine type cable is secured to the outside of the column pipe every 10 feet by stainless steel bands.

Petroleum ether, which vaporizes at a very low temperature is blended in with the motor oil. As the motor starts, heat generated in the air-gap vaporizes this ether and the rotor actually rotates in an oil vapor with consequent reduced friction. The oil filled motor will operate for indefinite periods of time without any maintenance. Some installations having operated 15 years or better without being touched.

Standard motor sizes are available from stock as follows:

Nominal Well Diameter	Horsepower	Volts
8″	7½ to 30	220 or 440
10″	40 to 75	220 or 440
10″	100	440
14″	100 to 200	440
15″	100 to 175	2200
17″	200 to 400	2200

Nominal size of motor permits installation in well diameters given above with ample clearance for water to flow past the motor into the pump. In most cases, special submersible motors can be supplied for odd voltages and for odd cycles. Standard pumps and motors are available up to 7000 GPM and special pumps have been built up to 20,000 GPM.

Growers who are contemplating new wells where water tables are low may well consider the submersible pump principle. Likewise, growers faced with the problem of receding water tables may find therein an economical solution to their problem.

BASIC CONSIDERATIONS

(Continued from Page 19)

CONCLUSION

Water is one of the most valuable assets of the farmer. Its efficient use is often the deciding factor between high yields and crop failure.

The farmer should find out what happens to his water when he applies an irrigation. Is the water distributed uniformly over all parts of his field? The use of a soil tube or a soil auger to examine the soil at various depths will give the answer. If not, an analysis of the four factors herein discussed as applied to each farm will help to solve the reason for the non-uniform distribution.

Unfortunately there is no way in which these four factors can be calibrated so that an easy solution to each problem can be obtained. Any one factor cannot be given a value without taking into consideration the other three factors. The farmer must learn by experience the best way to evaluate these factors so as to obtain the highest use of his water.

PROPER THINNING INCREASES YIELDS

By HARVEY W. PARKER
Field Superintendent, Spreckels Sugar Company

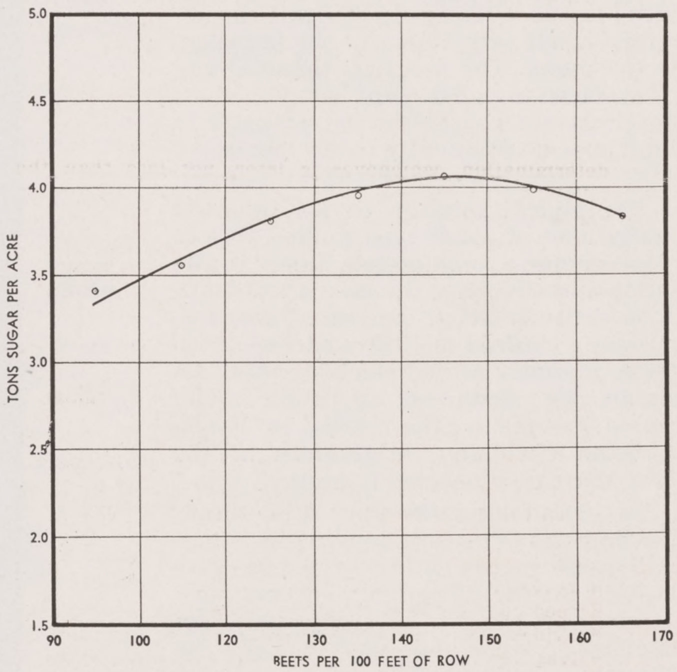
Repeated experimental demonstrations have proved that maximum yields can be realized only with adequate beet population. (Spreckels Sugar Beet Bulletin, Vol. XI, No. 5, Page 36 and Vol. XIII, No. 2, page 11.) In order to obtain enough beets per acre (25,000 or more) it has been the custom to instruct thinning crews to space the beets ten inches apart in the row. If every beet seedling survived, there would be (on 40 inch double beds) 31,363 beets per acre. But due to damage from cultivating, hoeing, insects, etc., only about 80% of the thinned stand survives, so that the harvest stand turns out to be about 25,000 beets per acre.

In areas of high fertility, 25,000 beets per acre is too low a population to take full advantage of the land's productive capacity. Mr. A. A. Tavernetti, Agricultural Extension Service Director of Monterey County, has suggested this easily remembered rule:

On 15 ton land, leave 150 beets per 100 feet of row.
On 20 ton land, leave 200 beets per 100 feet of row.

When this rule is followed, the harvest stand (at 80% survival) becomes 120 to 160 beets per 100 feet of row, or 31,000 to 41,000 beets per acre.

That Mr. Tavernetti's rule is a good one was proved by an extensive study in the Salinas Valley during 1949. Stand counts at harvest time were made on 9,059 acres over the entire district. Yield of beets per acre, sucrose content and stand count were recorded. The overall result, in which tons of sugar per acre were compared to stand count, is shown on the graph below. Maximum yield was obtained from stands of 145 beets per 100 feet of row.



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THIS CHART graphically demonstrates the effect of high beet population in increasing sugar per acre, with maximum yield from 145 beets per 100 feet of row. Close supervision at thinning time will insure high stand counts and consequent maximum yields.

REQUIREMENTS FOR RECEIVING PAYMENTS UNDER THE SUGAR ACT

By A. J. COELHO, *Executive Secretary, PMA County Committee of Monterey County*

THE Sugar Act Benefit payments which sugar beet growers receive each year are referred to in the Act as conditional payments. This means that growers are required to observe certain conditions in growing and harvesting their beets relative to wages paid, employment of child labor and acreage allotments in order to be eligible for their payments.

Since farm acreage allotments on sugar beets are not in effect for the 1950 crop, the labor requirements are the ones to which growers should pay particular attention this year. Other factors which affect the amount of each grower's benefit payment are the abandonment and deficiency payment provisions of the Act and the scale-down in the base rate of payment per cwt. of sugar produced by any one operator.

1. **Child Labor.** No child under the age of 14 years shall be employed or permitted to work in the cultivation, production and harvesting of sugar beets, except a member of the immediate family of a person who was the legal owner of not less than 40 per cent of the crop at the time the work was performed; no child between the ages of 14 and 16 years shall be permitted to do such work for a longer period than eight hours in any one day.
2. **Wage Requirements and Minimum Rates.**
   (a) **Wage Requirements**—The requirements of Section 301 (c) (1) of the Act shall be deemed to have been met with respect to the production, cultivation or harvesting of the 1950 crop of sugar beets in California if the producer complies with the following:
   (1) **Wage Rates**—All persons employed on the farm, or part of the farm covered by a separate labor agreement, shall have been paid in full for all such work and shall have been paid wages in cash therefor at rates as agreed upon between the producer and the laborer but, after the beginning of work on the 1950 crop of sugar beets or the date of issuance of this determination, whichever is later, not less than the following:
   (i) **For work performed on a time basis:**
      (a) Thinning, hoeing, or weeding; 60 cents per hour.
      (b) Pulling, topping, or loading: 65 cents per hour.
      (c) For workers between 14 and 16 years of age the above rates may be reduced by not more than one-third. Maximum employment per day for such workers, without deduction from Sugar Act payments to the producer is 8 hours.
      (d) For any work in the production, cultivation or harvesting of sugar beets for which a rate is not specified herein, such as fertilizing, plowing, preparing seed bed, or irrigating, the rate shall be as agreed upon between the producer and laborer.
   (ii) **For work performed on a piecework basis**— If thinning, hoeing, weeding, pulling, topping or loading work is performed on a piecework basis the rate shall be as agreed upon between the producer and the laborer: **Provided,** That the average earnings for the time involved on each separate unit of work for which a piecework rate is agreed upon shall not be less than the applicable hourly rate provided under subdivision (i), (a), (b) and (c) of this paragraph.
   (2) **Perquisites**—In addition to the foregoing, the producer shall furnish to the laborer, without charge, the perquisites customarily furnished by him, such as a house, garden plot, and similar items.
   (b) **Subterfuge**—The producer shall not reduce the wage rates to laborers below those determined herein through any subterfuge or device whatsoever.
3. **Abandonment and Deficiency Provisions.**
   Not less than 10 per cent of the sugar beet farms in the County or in an area as specified by the County Committee must be deficient in sugar production for that year before any farm in the County is eligible for either an abandonment or deficiency payment. To be deficient the sugar production of the harvested acreage must fall below 80 per cent of the normal production established for that acreage. Abandoned sugar beet acreage must have been inspected and measured by a representative of the County PMA Committee prior to destruction. Both abandoned acreage or crop deficiency must have been caused by drought, flood, storm, freeze, disease or insects. Eligible abandoned acreage will earn a grower a payment equal to one-third of the normal production of sugar for that acreage multiplied by the applicable Sugar Act rate. The following examples are based on the assumption that the normal yield for that farm is 60 cwts. of suger per acre.

Example:

10 acres abandoned
Normal production=10 acres x 60 cwts.=600 cwts.
Payment—(1/3 x 600) 80¢=$160.00

Deficiency payments are made to those farms where the actual production of sugar for the year has fallen below 80 per cent of the normal production for the farm due to any of the six eligible causes. The payment is calculated on the difference between the actual production and 80 per cent of the normal production multiplied by the applicable rate of payment.

Example:

Normal production on 100 acres	6000 cwts.
80% of normal production	4800 cwts.
Actual production on 100 acres	4000 cwts.
Deficiency payment	80¢x800 cwts.=$640.00
Grower's total payment	4800 cwts.x80¢=$3840.00

The calculated amount of sugar eligible for either abandonment or deficiency payment is included in with that actually produced and the grower's payment is computed on the total cwts. of sugar then shown on his application for payment. Only one check is issued for the entire amount.

The basic rate of payment to growers is 80 cents per cwt. of recoverable sugar. However, beyond the first 7000 cwts. produced by any one grower during the year, there is a reduction from the total payment as follows:

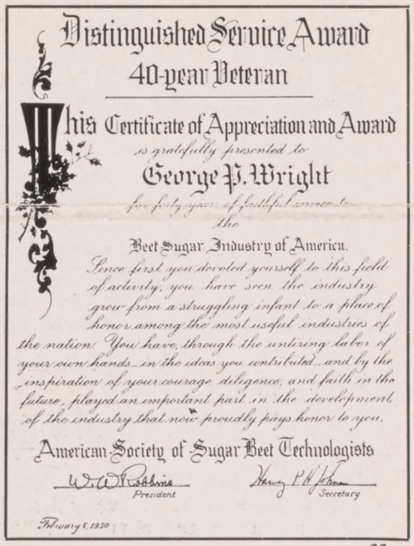
Cwts. for payment	Reduction per Cwt.	Rate of Payment
1 to 7000	0	80¢
7001 to 14,000	5¢	75¢
14,001 to 20,000	10¢	70¢
20,001 to 30,000	20¢	60¢
30,001 to 60,000	25¢	55¢
60,001 to 120,000	27½¢	52½¢
120,001 to 240,000	30¢	50¢
240,001 to 600,000	32½¢	47½¢
More than 600,000	50¢	30¢

For Sugar Act purposes the definition of a "farm" is all land farmed by an **operator-producer** within a State, except that if land situated in more than one State is farmed by the same operator, and if part of the work stock, farm machinery, or labor used in the operation of the land in one State is also used in the operation of the land in the other State or States, all such land shall be considered as one farm.

SPRECKELS MEN RECEIVE AWARDS FROM AMERICAN SOCIETY OF SUGAR BEET TECHNOLOGISTS

TWO VETERAN members of the Spreckels Agricultural Department achieved honor and distinction when they were presented with Certificates of Appreciation and Award for forty years of faithful service to the Beet Sugar Industry of America.

These Certificates were awarded by the American Society of Sugar Beet Technologists on the occasion of their regular biennial meeting held at Detroit on February 6 to 9, 1950. Formal presentation was made by Guy D. Manuel, General Agriculturist of the Spreckels Sugar Company.



Distinguished Service Award
40-year Veteran
This Certificate of Appreciation and Award
is gratefully presented to
George P. Wright
for forty years of faithful service to
the
Beet Sugar Industry of America.
Since first you devoted yourself to this field of activity, you have seen the industry grow from a struggling infant to a place of honor among the most useful industries of the nation. You have, through the untiring labor of your own hands... in the ideas you contributed... and by the inspiration of your courage, diligence, and faith in the future, played an important part in the development of the industry that now proudly pays honor to you.
American Society of Sugar Beet Technologists
President
Secretary
February 8, 1950

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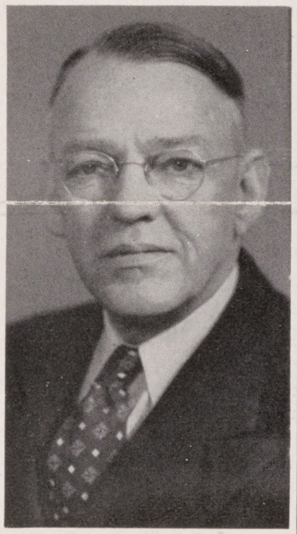
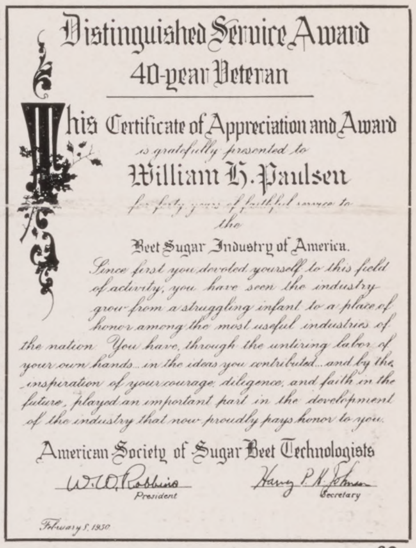
George P. Wright, District Manager, Spreckels Sugar Company, Spreckels, California





Distinguished Service Award
40-year Veteran
This Certificate of Appreciation and Award
is gratefully presented to
William H. Paulsen
for forty years of faithful service to
the
Beet Sugar Industry of America.
Since first you devoted yourself to this field of activity, you have seen the industry grow from a struggling infant to a place of honor among the most useful industries of the nation. You have, through the untiring labor of your own hands... in the ideas you contributed... and by the inspiration of your courage, diligence, and faith in the future, played an important part in the development of the industry that now proudly pays honor to you.
American Society of Sugar Beet Technologists
President
Secretary
February 8, 1950

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William H. Paulsen, Agricultural Superintendent, Spreckels Sugar Company, Spreckels, California

GEORGE WRIGHT was born in Hayfield, Dodge County, Minnesota, in January 1891. He first became associated with the beet sugar industry in 1910 when he became a Field Superintendent for The Great Western Sugar Company in the Fort Collins, Colorado, area. Between 1911 and 1919 he was Field Superintendent for the San Luis Valley Beet Sugar Company at Monte Vista, Colorado; Foreman for the Union Sugar Company at Betteravia, California; and Agricultural Superintendent for the Alameda Sugar Company at Alvarado, California.

In 1919, Mr. Wright joined the Spreckels Sugar Company as District Field Superintendent in San Rafael, California. In 1937 he was appointed District Manager of the Sacramento-San Joaquin area of the Spreckels Sugar Company, and since 1942 has been in charge of the Company's Salinas Valley coastal area as District Manager.

Mr. Wright was a pioneer in the development of sugar beet agriculture in the Sacramento Valley. Through his interest in improving the production of this crop he helped develop an irrigation program for sugar beets in the area, encouraged growers to level land, promoted the application of fertilizers, emphasized the necessity for proper rotation, and in general demonstrated the value of good farming practices. Largely through his intensive efforts, the Sacramento area has developed into an excellent sugar beet producing district.

BILL PAULSEN was born on a sugar beet ranch near the first sugar beet factory built by Claus Spreckels in 1888 at Watsonville.

He was first employed by Spreckels Sugar Company in 1902 as a teamster on the ranches operated by the Company near Gilroy and Soledad, California, and has never worked for any but the Spreckels Sugar Company.

Between 1909 and 1928 he worked successively as Ranch Bookkeeper and Foreman, and as Field Superintendent. In 1928 Mr. Paulsen was made Agricultural Superintendent of the Salinas Valley Agricultural District.

Mr. Paulsen was instrumental in the development of good farming practices for sugar beets in the Salinas Valley. He noted the success with which lettuce was being farmed on ridges in the Salinas Valley. He helped apply this principle of bed planting to sugar beets to the end that all sugar beet crops in the Salinas Valley are now planted on beds with marked success in the production of high yielding crops. Mr. Paulsen urged the following of a rigid rotation program to control nematode. Growers complied with his recommendations and spread of the nematode has been held in check through these efforts. He also was active in the work done on Curly Top in the Salinas Valley and worked closely with growers on the use of new resistant varieties as they were developed by the government agencies.

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.
AUSTIN ARMER, Editor
600 California Fruit Bldg., Sacramento, Calif.

SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

Vol. XIV JULY-AUGUST, 1950 No. 4

33

SUGAR BEETS WITHOUT TOPS

Beater-topping with well-planned digging and loading can mean economical harvesting.

HARVESTER IMPROVEMENTS
HARVEST ECONOMIES
FACTORY IMPROVEMENTS

as discussed in this issue will help to make 1950 a profitable beet year.

HONEY-DEW

BEATER TOPPING SUCCESSFUL ON 700 ACRE CONTRACT

By ROY MATTLEY
Owner, Davis Machine Works

CARL BECKER AND HENRY FORDEN have grown beets in the Davis District for several years, and have always relied upon hand labor for harvest. However, their exceptionally large acreage in 1940 presented a harvest problem, since a labor shortage might develop and since they did not own a tractor large enough to pull a two-row Marbeet harvester.

It was suggested that the beets might be beater topped provided that I could build a suitable beet lifter for mounting on one of the four available wheel tractors. Accordingly we worked out a two-row plow which operated quite shallow and which raised the beets well above the surrounding clods. The plow was mounted on a Farmall M tractor.

In order to make the most effective use of the beater principle, two Olson Roto-beaters were purchased and equipped with 30 h.p. gasoline engines instead of the customary power take-off drive.

Arrangements were made with a labor contractor to supply enough men on an hourly basis to windrow and load 20 tons per hour.

34

ALL FOLIAGE is beaten off by rotary flails. Two passes of the beater are required.

35

THE GROWER, Carl Becker, and the author, Roy Mattley, show how cleanly beets can be beater-topped.

OPERATION OF THE EQUIPMENT

It was found that satisfactory topping could be accomplished with two passes of the beater, provided that the tractor speed was kept low.

One or two days after beating off the tops, the disintegrated foliage in the furrows had dried enough so that it gave no interference to the plows. Some experimental work was necessary in order to get the plows to perform properly, but once adjusted no further trouble was encountered.

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AFTER TOPPING, a specially designed light-draft plow lifts two rows of beets.

37

FOUR MEN windrow the topped and lifted beets.

38

EIGHT MEN load the windrowed beets into trucks.

WHY NOT HARVEST ALL OF YOUR BEETS?

By AUSTIN ARMER
Agricultural Engineer, Spreckels Sugar Company.

THIS TITLE IS A QUESTION of real concern to all beet growers, and we have been seeking the answer for a long time.

It is a fact that all the beets in any field are not harvested. This is painfully evident when a brisk rain falls on a recently harvested field. A startling number of whole beets, tails and broken pieces show up after the shower has washed them to a vivid white.

Just how many tons per acre are left in the fields was the subject of a study conducted by the Spreckels Sugar Company Agricultural Department in January, 1950. Many beet fields had been disked up after harvest, and heavy rains washed the remaining beets and fragments clean enough for easy recovery. The fields chosen for study had been harvested by hand, by Marbeet harvester (2 row), and by beater-topper plus hand loading. Two fields harvested by each method were sampled in the Woodland-Davis-Dixon area.

Ten samplings were made in each field. Each sampling was made from a square plot of .01 acre. Every piece of beet, whether entire root (over 1¼ inches diameter), fragment or excessively thick crown was collected and weighed. Since all fields had been harvested only a few days before sampling, and since the weather was cool and damp, it was assumed that no weight loss had occurred in the beet fragments remaining in the fields. Since the harvested yield for each field was known, it was possible to convert the actual weight losses into percentage of total crop. A table of the findings follows:

Harvest Method	Tons Per Acre Lost (average)	Tons Per Acre Harvested	Percent of Total Yield
Hand (Field 1)	1.14	23.00	4.93%
(Field 2)	2.19	34.00	6.06%
Marbeet (Field 1)	0.60	20.50	2.84%
(Field 2)	1.75	34.00	4.67%
Rotobeater (Field 1)	1.27	15.38	7.63%
(Field 2)	1.45	22.00	6.45%

It is to be noted that hand-gleaning had not been used in any of the fields sampled.

DOES IT PAY TO GLEAN BY HAND?

If our tabulation is a fair guide, the answer to this question is an emphatic "Yes". At $12.50 a ton, the beets remaining after harvesting these fields were worth from $7.50 to $27.37 per acre. While no gleaning laborer can be expected to find all the lost beets, it is reasonable to expect him to recover at least half, with a value of $3.75 to $13.68 per acre.

(Continued on Page 31)

39

A SLED towed by the harvester is an inexpensive aid to the gleaning laborers.

40

SOME HARVESTERS have been equipped with conveyor belts (B), onto which gleaned beets are tossed. These beets then go to the truck via the main elevator.

41

THIS IS THE appearance of many harvested fields after a rainstorm. Hand gleaning at harvest time can save this serious loss.

NEW SUGAR BEET PEST CAN BE CONTROLLED

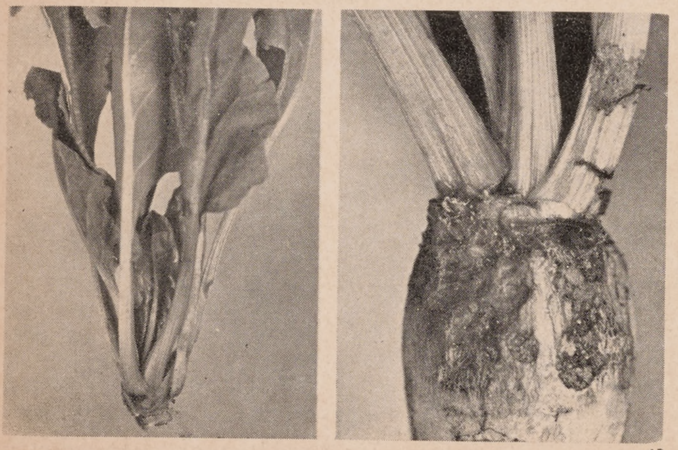
By W. HARRY LANGE, JR.
Assistant Entomologist, University of California, Davis

(Reprinted from CALIFORNIA AGRICULTURE, May, 1950)

THE sugar beet crown borer—*Hulstia undulatella*—a relatively unknown pest of sugar beets, caused severe damage to seedling and half-grown sugar beets in Yolo, Yuba, and Solano counties during 1949. Although it probably causes some damage annually it apparently has not been reported in the scientific literature as a California pest since 1905 when damage was reported at Chino, Huntington Beach, Oxnard, Spreckels, and in the Santa Ana Valley.

During June, 1949, this insect was first found damaging experimental, nutrient-fed sugar beets grown in sand at Woodland. By late June and during July the larvae were causing extensive damage to sugar beets in the field. During August caterpillars attacked seedling broccoli.

The known food plants of the caterpillars are sugar beets, broccoli, pigweed, purslane, sour dock, and spinach. Probably other food plants remain to be discovered. On sugar beets the larvae may feed on the crowns of the plants, on the petioles near the ground, on leaves touching the soil surface, or may actually bore into the roots. The larvae move back and forth inside characteristic silken tubes which are often two to six inches long and radiate out from the beet roots just under the surface of the soil. The tubes can often be removed in their entirety. The caterpillars feed primarily upon the crown area and their feeding may be superficial in nature, or may actually cause girdling of the roots. At night the caterpillars apparently leave the burrows to feed. Partial girdling of the roots may cause a weakened condition so that the wind often breaks off the roots at the ground level. The feeding holes may also allow an avenue for the entrance of rot organisms.



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LEFT—A young beet plant cut off at crown level by borings of the larvae.
RIGHT—Blackened scars on an older beet which survived the borers' attack.

On broccoli the caterpillars feed upon the stems near the soil surface often causing the plants to fall over and the leaves touching the soil surface are subsequently webbed to the ground.

LIFE HISTORY

The adult moth is gray with a wing expanse of about three-fourths inch, and the fore wings have two characteristic undulating transverse white lines. The elliptical, yellow eggs are laid singly on the petioles of the plants. Upon hatching the larva is one-eighteenth inch long and crawls down to the crowns where it starts feeding. Four moults occur, the caterpillars attaining a length of three-fourths inch when mature. The mature caterpillars are flesh-colored with wavy reddish, lengthwise stripes. The brown pupae occur inside the silken tubes.

Adult females during 1949 laid from 36 to 637 eggs, with an average of 294 eggs. About two days elapsed between mating and egg laying and adults lived about two weeks. The egg period varied from five to six days at mean average temperatures of from 74° F to 78° F.

At least two generations occur in the field a year. Under caged conditions at a mean average temperature of 76° F, a complete life history was completed in from 34 to 39 days.

CONTROL

A series of replicated plots was treated by means of rotary hand dusters and compressed air sprayers during July, 1949, at Woodland. The chemicals were applied when the beets were four to five inches high. These experiments indicated that DDT and parathion both as dusts and sprays showed promise and should be included in future experimental work. DDT as a 10% dust at the rate of 90 pounds per acre was effective as was a 50% wettable DDT powder applied as a spray at the rate of two pounds per 88 gallons of spray per acre. A 2% parathion dust at the rate of 107 pounds per acre, and a parathion spray of two pounds of 20% wettable powder to 88 gallons of spray per acre, were also effective. Under the conditions of this experiment the other materials used were not as effective as DDT and parathion. In order to secure adequate control it was found necessary to concentrate the chemicals at the bases of the plants.

(Continued on Next Page)

RESULTS OF HAND APPLICANTS OF INSECTICIDES TO SUGAR BEETS FOR THE CONTROL OF CATERPILLARS OF THE SUGAR BEET CROWN BORER. U. S. NO. 33 SUGAR BEETS WERE PLANTED AT WOODLAND JUNE 1, 1949 AND INSECTICIDES APPLIED JULY 11, 1949. CONTROL DETERMINED JULY 18 AND 19, 1949.

Treatment and Material Used	Amount Actual Chemical per Acre, Pounds	Average Number Live Larvae per Plant	Control
DDT dust, 10%	9.00	0.00	100%
DDT spray, 50% wettable powder	1.00	0.12	88%
Lindane spray, 25% wettable powder	0.25	0.31	69%
Aldrin dust, 1%	1.07	0.49	51%
Aldrin dust, 2½%	2.87	0.22	78%
Aldrin spray, 25% wettable powder	0.25	0.43	56%
Dieldrin spray, 25% wettable powder	0.25	0.39	60%
Chlordane emulsion spray, 74%	1.00	0.34	66%
Chlordane spray, 40% wettable powder	1.00	0.30	70%
Parathion dust, 2%	2.14	0.00	100%
Parathion spray, 20% wettable powder	0.40	0.00	100%
No treatment	......	0.99	....

ONE WAY TO HARVEST BEETS IN WATER GRASS

By RAY TALCOTT
Field Superintendent, Spreckels Sugar Company

HARVESTING sugar beets last year under severe water grass conditions presented the usual aggravating and baffling problems to Forest and Edwin Neff, brothers who farm near Arvin, California. However, their solutions to these problems were unusual, successful and inexpensive. Before their harvest was over, they were able to cover ten grassy acres a day with a Marbeet two-row harvester without a single extra operation.

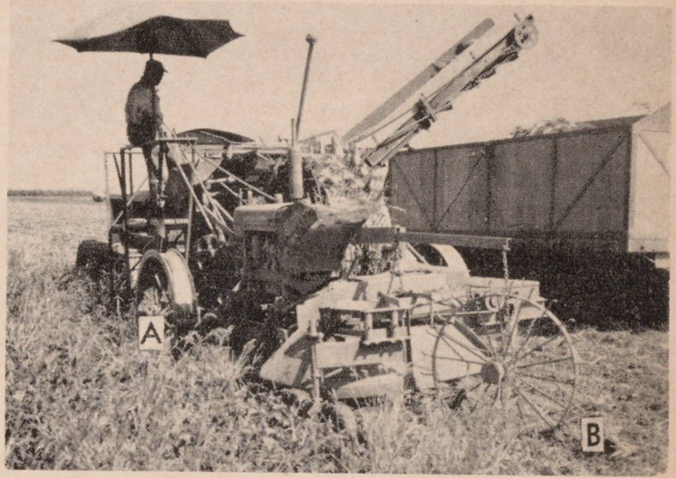
The Neff boys wished to get by without any of the additional operations usually felt to be necessary in combatting water grass, such as mowing, raking, and burning, or roto-beating repeatedly, or possibly even falling back on hand harvest as a last resort. They concentrated their energy and resourcefulness on the harvester itself, which was a 1944 Marbeet two-row mounted on steel wheels and equipped with a Blackwelder two-row defoliator.

They found the defoliator was able to eliminate most of the grass above the beets, but the stems in the furrows caused trouble by plugging up the plows. In order to cut all this growth in the left-hand furrow, the Neffs made the left-hand ground wheel into a coulter by welding two rims edgewise around the outer circumferences of the wheel. These rims were ⅜" x 2" steel and were applied by tack-welding one end, heating the iron and bending it down and then tacking it again. After getting the rims on, they sharpened them with a cutting torch. It was found that after once being sharpened, these rims stayed sharp through use. In moist ground it was helpful to mount a scraper on the frame in order to keep the dirt from filling up the space between the rims.

This "coulter" wheel cut everything cleanly away from the left side of the bed, leaving the right-hand furrow to be cleaned out, as the defoliator deposited large quantities of material exactly where it would catch on the right-hand plow standard. To overcome this obstacle, the Neffs fashioned a Morril-type rake wheel from an old iron cultivator wheel, having a 36" diameter. They welded 4" spikes of ½" round every five inches around the rim of the wheel. Then they mounted it on the end of an adjustable-length pipe (about 65" in this case), which was hinged to the right rear corner of the defoliator frame so that the rake wheel would run in the furrow at an angle.

To aid in eliminating the increased amounts of tangled vegetation passing over the foliage conveyor belt, the Neffs welded two ¼" square strips on the lower filter roll and riveted 12" hardwood cleats every 12 inches along the belt.

It must be remembered that this was strictly a salvage operation. The Neffs had a poor crop and were trying to minimize their loss rather than increase their profit. There must be no inference made from this article that an easier harvest sanctions the existence of water grass. However, if a grower does wage a battle against this weed, this is one possible solution to his harvest problem.



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PRINCIPAL FEATURES of the Neff harvester are the ground wheel coulter (A) and the rake-wheel (B).

SUGAR BEET PEST

(Continued from Page 28)

Control of the caterpillars attacking broccoli was difficult, although the repeated application of DDT sprays concentrated in the plant rows was fairly successful.

The periodicity of abundance of this insect makes it difficult to predict its future economic status as a sugar beet pest in California. Damage to sugar beets in 1949 was correlated with time of planting. Beets planted in May and June were in a more susceptible stage of growth during July and August than those planted prior to this time. During years when beets can be planted prior to May and June they usually will be established firmly prior to abundance of the crown borer.

BEATER TOPPING

(Continued from Page 26)

IS BEATER TOPPING ECONOMICAL?

The labor cost on windrowing and loading the topped beets was about the same as current hand loading charges for topping and loading. However, Mr. Becker and Mr. Forden believe that beater topping saved them money because of the remarkably high recovery of beets. Their average yield was close to 26 tons per acre with 15.83 per cent sugar content. The saving in crowns alone amounted to approximately one ton per acre. The tap roots were exceptionally well preserved and the recovery of beets by the windrowing crew was much better than an average Marbeet harvester or a hand crew hampered by the usual amount of trash in the field.

GROWER OWNERSHIP OF HARVESTERS IS INCREASING

SINCE the first Marbeet harvester was purchased by the Spreckels Sugar Company in 1943, the Company has kept records of acreage harvested by machine for each succeeding year.

Every completed contract record shows how the acreage was harvested; whether by hand, by rented harvester, by contractor-operated harvester or by grower-owned harvester. When these figures are plotted on a bar chart, the trend toward grower ownership is vividly displayed. (See chart below.)

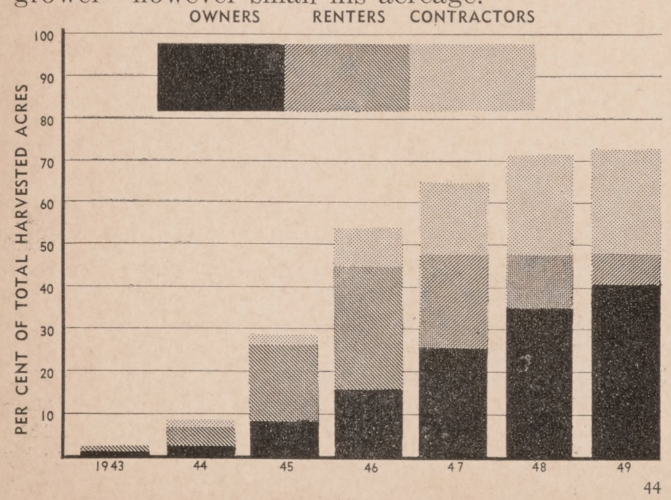
Grower ownership has almost eliminated the rental of Company-owned harvesters. Grower-owned harvesters accounted for 40.4% of all acreage harvested by Spreckels growers in 1949, and recent harvester sales point toward a sharp increase in 1950.

Whereas the trend toward grower-ownership of harvesters is very evident, Spreckels Sugar Company will continue to serve its growers by providing rental machines.

ONE-ROW HARVESTERS BECOMING POPULAR

One of the most important factors leading toward grower-ownership is the fast growing popularity of one-row harvesters. One manufacturer has firm orders for over a hundred such machines for California delivery. The low-cost tractor mounted machine, able to harvest up to a hundred tons a day, holds a strong appeal to economy-minded growers.

If these little machines perform in 1950 as well as early trials have indicated, there is good reason to believe that they will end the era of harvester rental from the Company. There is strong evidence that the history of mechanical grain harvesting will be repeated. The low-cost, efficient small combine has become a fixture on nearly every farm, and has displaced most of the big combines and stationary separators. A successful small beet harvester may well become standard equipment for every beet grower—however small his acreage.



GROWER-OWNERSHIP of harvesters is growing steadily, as shown by the black areas of this chart.

FOUNDATION STAGES ANNUAL HARVESTER TRIALS

EACH year at the start of the Imperial Valley sugar beet harvest, experimental sugar beet harvesters engage in field trials. These trials are under the auspices of the Beet Sugar Development Foundation who keep a watchful eye on the progress of harvester inventors. They invite the inventors of the more promising machines to take advantage of Imperial Valley's early harvest season and get some actual field experience several months before beet harvest starts in other sections of the country.

The 1950 trials were ably directed by Mr. Harvey P. H. Johnson, Manager of the Beet Sugar Development Foundation at Fort Collins, Colorado. A well timed program permitted interested spectators to see each experimental machine operating in previously prepared plots. The audience included not only representatives of all American beet sugar processors, but was notable for the large attendance by beet growers, many of whom flew to the demonstrations in their own planes. Interest in the trials was worldwide and sugar beet men from as far away as Israel were in attendance.

Exhibits fell into two classes, those of commercial machines already in production, and those of experimental machines whose inventors were attempting to demonstrate new principles rather than machines ready for sale.

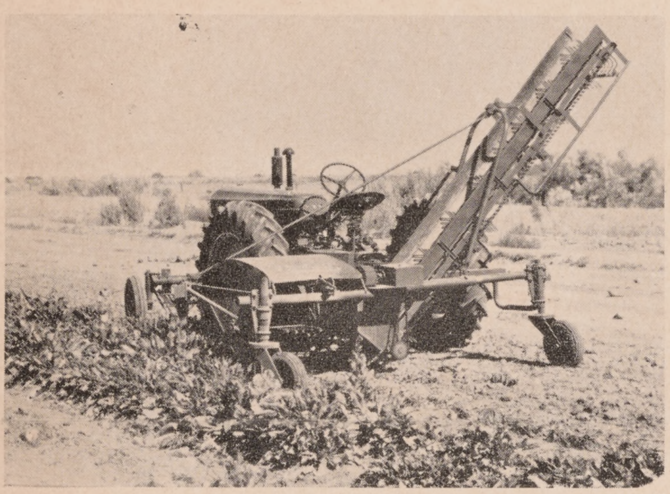
Among the commercial machines shown were McCormick Deering (International) and Scott-Urschel. A new digger principle by John Deere was demonstrated, although the regular production machine was not shown. The Marbeet Midget did not take part in the official trials, although many of these little machines were in evidence throughout the Imperial Valley engaged in the commercial harvest of beets.

Machines of a strictly experimental nature were shown by the Harvall Manufacturing Company of Minneapolis and the U. S. Farm Equipment Company of San Francisco. These two exhibitors are by no means the only concerns working on new harvester ideas. A number of inventors throughout the country are at work but were not prepared to demonstrate their developments.

The impression gained from witnessing the Imperial Valley harvester trials is that a great deal of credit is due the manufacturers of present commercial machines. They all have their faults and we hope that they will all continue to improve. However, they have come a long way and deserve full credit for their accomplishments. At the same time one is impressed by the fact that there may yet evolve a radical and improved principle of beet harvest. This impression is strengthened by the excellent ingenuity displayed by some of the experimental machines.

SEE PHOTOS ON NEXT PAGE

EXPERIMENTAL MACHINES



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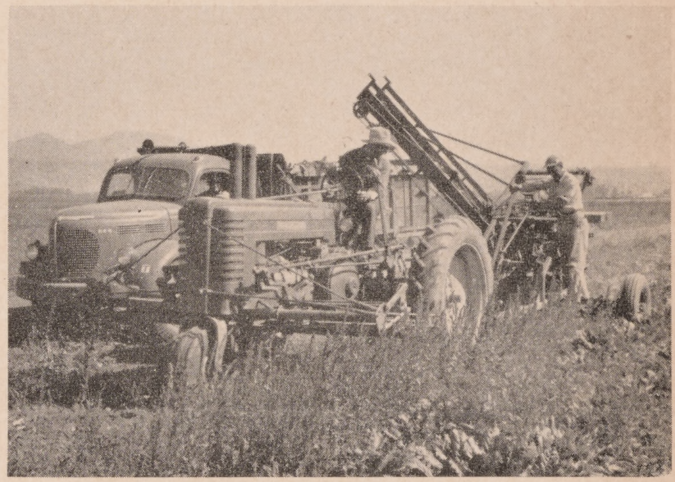
THE "beetsall" harvester is under development by Mr. C. E. Ashley of the U. S. Farm Equipment Co. of San Francisco.

46

THIS is a one-row-experimental model of the Harvall machine. The two-row model has been popular in Minnesota.

PRODUCTION MACHINES



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THE Scott-Urschel harvester is an old favorite in Michigan. With minor changes it does well in California's larger beets.

48

THE Marbeet Midget, Model D, was not a part of the Foundation harvester display, but several units were operating commercially in nearby fields.

WHY NOT HARVEST—

(Continued from Page 27)

If the gleaner can cover four acres a day, his efforts will pay his employer $15.00 to $54.74 per day.

From these figures it is evident that only one-fourth ton per acre need be recovered in order to make gleaning break even.

HOW TO AVOID HARVESTING LOSSES

Each method of harvest has its own problems. Hints for avoiding losses will be given under the headings of Hand Harvest and Machine Harvest.

Hand Harvest

1. Avoid Trash in the Field.
   (Easier said than done, for it means good weed control throughout the growing season.)
2. Keep the Beet Plow on the Row.
   (Many beets—especially big ones—are broken or left rooted when the plow is off-row.)
3. Supervise the Harvest Crew.
   (They are human—they will do only what is expected of them.)

Machine Harvest

1. Find the Best Plow Adjustment and Leave it.
   (Improper plow adjustment will break beets, leave them rooted, or slant them so as to produce wasteful topping.)
2. Do Not Overload Trucks.
   (After a truck is full, beets will roll off. Nothing is gained by trying to put an extra few hundred pounds on an already full load.)
3. Be Sure the Tractor is not Breaking Beets.
   (Harvesters are often blamed for breaking big beets when the real cause is breakage by the drive housing or wavy steering of the tractor.)

GROWERS WILL BENEFIT FROM ENLARGED AND IMPROVED FACTORY FACILITIES

By W. K. GRAY
Vice President, Spreckels Sugar Company

THE SPRECKELS SUGAR COMPANY has installed many items of equipment in its factories the past few years that have added to factoy capacity, either directly or indirectly, for processing sugar beets more efficiently and at a higher daily rate.

Mechanical harvesting has materially increased the amount of trash delivered with beets. Additional trash removal equipment has been necessary in order to minimize the adverse effect of trash at the beet slicing stations. An additional beet cutter knife sharpening machine has been added at Spreckels factory. Trash is still a serious problem, both from the standpoint of maintaining factory capacities and from a disposing standpoint, and much study remains to be done before the trash problem can be economically solved.

WATER CONSERVATION

Making sugar from sugar beets requires very large quantities of good quality water. The quality of water used has a marked effect on operating and maintenance costs. Since conservation of underground water supplies is also important, an induced draft cooling tower was installed at Spreckels factory in 1948, at a cost of more than $60,000. This cooling tower has a capacity of 6,000 gallons of water per minute—that is, it can cool this quantity of excess hot condenser water for reuse in the cold water supply system. Without this equipment the 6,000 gallons of hot water per minute would be sent to waste and 6,000 gallons of new cold water per minute would have to be drawn from wells adjacent to the factory.

Use of liquid sugar by canners, preservers, soft drink manufacturers and some other industrial users has increased steadily since 1948. We have added to our facilities at all three factories and our present capacity permits manufacture and shipment of approximately 180,000 gallons per day. This is equivalent to nearly 15,000 100-pound bags of sugar per day.

BY-PRODUCT

Five years ago we installed, at Woodland, equipment for concentrating the waste liquor from the Steffen house. This concentrate is sold to International Minerals and Chemical Corporation at San Jose, for the production of Mono-Sodium Glutamate, a taste intensifer, marketed by them under the trade name of "Ac'cent." Concentration of this waste liquor eliminates a troublesome disposal problem. The Woodland operation was successful and similar, but much larger concentrating equipment was installed at the Spreckels factory in 1947. In connection with this installation at Spreckels, it was necessary to install a 175,000 pound-per-hour steam boiler as the old boilers did not have sufficient capacity to carry the increased load.

GREATER SLICING CAPACITY

One of the most interesting additions made at the Woodland and Spreckels factories have been the Oliver-Morton continuous diffusers. The first pilot plant size unit of this type was installed at Woodland in 1948. This was followed in 1949 by the installation of a 24-cell unit at Woodland, and a 28-cell unit at Spreckels. The Woodland unit has displaced the batch operated cell battery which is one of the largest of its type, and which is now being moved to Manteca. This cell battery is expected to materially increase the slicing capacity of Manteca in 1950.

The 28-cell Oliver-Morton continuous diffuser displaced two somewhat smaller cell batteries at Spreckels and was a big factor in making it possible to slice in excess of 6,000 tons of beets per day, part of last campaign. It is expected that all three factories will extract sugar from more beets more efficiently in 1950 than ever before.

In 1948, Spreckels factory was equipped to reclaim pulp press water for reuse in desugarizing molasses. This process not only helps conserve the underground water supply, but reduces the amount of waste water to dispose of, and recovers a worthwhile quantity of sugar through the Steffen process.

It has been necessary to enter the sugar specialty field and equipment was installed in 1948-49 to produce Bakers and Powdered sugars in 1-pound cartons and 100-pound bags. Currently, a process is being perfected and equipment installed for producing Brown sugar. This product will be on the market within a matter of weeks.

OTHER IMPROVEMENTS

Other major improvements under way at this time are, at Spreckels, the installation of a second 175,000 pound-per-hour steam boiler, a 3000 kw, 4160 volt AC turbo-generator with partial conversion of the electrical power system from direct current to alternating current, and the substitution of electric motor drives for the steam engine and belt drives in the pulp drier. At Woodland the factory has about outgrown the 2,000 kw turbo-generator installed when the factory was built. A new 1,000 kw turbo-generator will be in operation there in 1950 to carry a portion of the load.

Although we have mentioned only items of major equipment recently added, there have been many smaller additions that are important from the standpoints of efficiency, capacity and safety. Including expenditures to be made before the start of the 1950 campaign the company will have spent in excess of $2,500,000 on factory equipment additions and necessary major replacements since 1948.

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.
AUSTIN ARMER, Editor
600 California Fruit Bldg., Sacramento, Calif.

SPRECKELS SUGAR BEET BULLETIN

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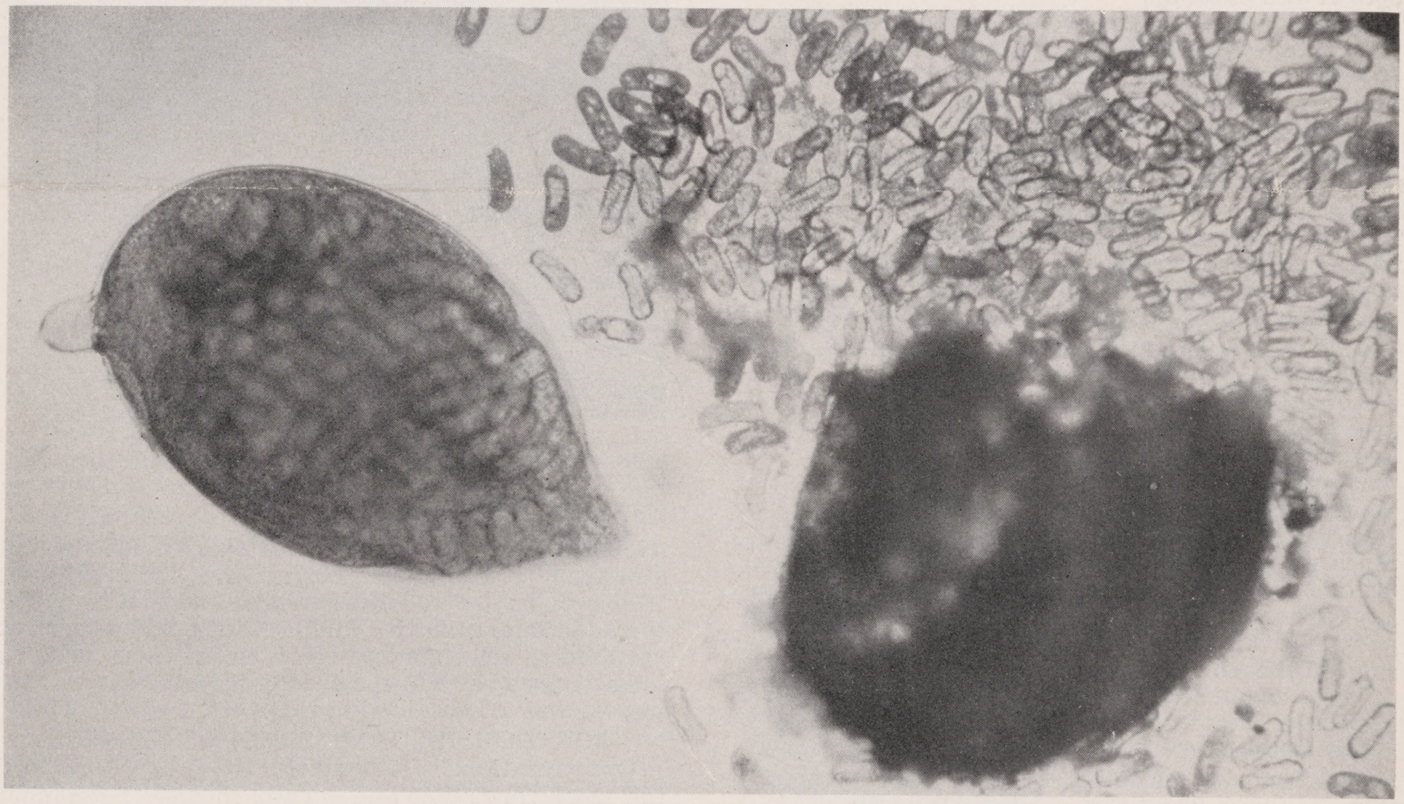

Sugar Beet Nematode—Female Cysts (Magnified 100 times). Photomicrographs courtesy of C. W. McBeth, Nematologist, Shell Agricultural Research Laboratories, Modesto, Calif.

TROUBLE STARTING

Sugar Beet Nematode multiplies at an alarming rate.
One female cyst may release over 600 larvae.

PROPER ROTATION
WEED CONTROL
EARLY PLANTING

Are some of the steps in controlling Sugar Beet Nematode.
This issue contains detailed, frank information on control methods.

HONEY-DEW

SUGAR-BEET NEMATODE CONTROL

By DEWEY J. RASKI
Assistant Nematologist, Division of Entomology and Parasitology, University of California, Berkeley, California.

THIS YEAR the sugar-beet nematode has again taken its toll from beet growers in almost every major beet producing area in California. The nematode will continue to be the cause of ever increasing losses until adequate measures are taken to curb its spread and build-up.

The sugar-beet nematode is not a new problem in this state. It has been well established here for over 50 years and is a major limiting factor in the production of beets in infested fields.

CONTROL BY SOIL FUMIGANTS NOT RELIABLE

Since the discovery of the nematode a great many remedies have been considered and tried in an attempt to limit its spread and reduce the severity of its attack. None has been as successful as crop rotation. In the past few years a great deal of attention has been given to the application of dichloropropene mixtures, known commercially as Shell D-D and Dowfume N, to fields infested with sugar-beet nematode.

At best these materials are expensive and only good for one season. Applications would have to be repeated every year. In addition, however, there are important limitations to the successful application of the fumigants. It is not a question of the effectiveness of the chemicals since they are good nematicides. Yet the results obtained from the application of these chemicals have not been consistent in California. The most important limiting factor appears to be the soil type as measured by its moisture holding capacity and expressed as moisture equivalent of field capacity.

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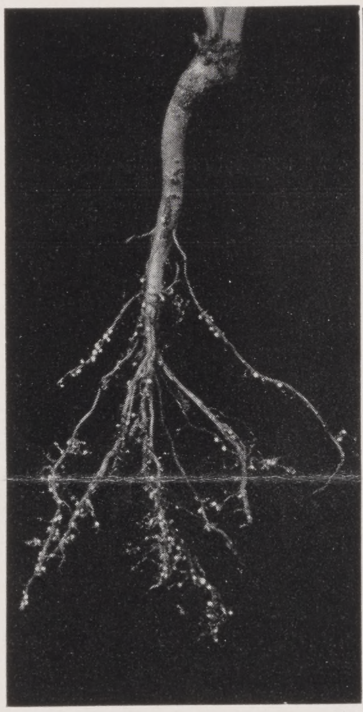
SUGAR BEET Nematode, female cyst, enlarged 90 times (longitudinal section).

The more successful applications have been made in light, sandy soils in which the fumigants have a more effective killing range that may permit attempts at control. However, the heavier soils, moisture equivalent 20 per cent and higher, limit the dispersion of the gas so that even greatly increased dosages often have no effect on the nematodes. Unfortunately, most of the infested fields on which beets are grown in California have heavy soils with moisture equivalents ranging from 25 per cent to 40 per cent and higher. As a result soil fumigation at present is not a control that can be relied upon to combat this pest.

The uncertainty of chemical control means that the beet growers with infested fields will have to make use of every bit of knowledge there is



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LEFT—A sugar beet seedling root infested with sugar beet nematode.
RIGHT—A mature sugar beet, with typical abundant hair roots characteristic of nematode attack.

available in order to live with this nematode and still grow profitable beet crops. Also, those growers whose fields are not infested will find it well worth the additional attention and precautionary measures required to keep the nematode out of their fields as long as possible. Once a field is infested there is no known way of eradicating this pest.

ROTATION THE MOST EFFECTIVE CONTROL

Crop rotation, if it is conducted properly, is still the most consistent and certain means of reducing damage to beets by this nematode. To be effective the minimum rotation program should include beets only once in four years, possibly once in five years for fields with very heavy infestations. The alternate crops should never include a susceptible host unless it is considered to be the same as a beet crop in the rotation. In addition to sugar beets and table beets, other hosts of the sugar-beet nematode include spinach, mustard, cabbage, cauliflower, brussels sprouts, turnip, radish, rutabaga and other crucifers. Alternate crops not attacked by the nematode include any of the following: carrots, beans, tomatoes, alfalfa, onions, celery, lettuce, peas, clover, corn, wheat, barley, oats and any not specifically mentioned as hosts.

WEED CONTROL IMPORTANT

During the rotation program it is essential to eliminate the weeds in the alternate crops since several of them, including pigweed, lambsquarters, purslane and wild mustard, are good hosts for this nematode. The mustard, so frequently found in grain and alfalfa fields, is probably one of the most common reasons for many of the failures of rotation programs to control this nematode.

(Continued on Page 40)

SUGAR BEET NEMATODE IN THE SALINAS DISTRICT

By G. P. WRIGHT

District Manager, Spreckels Sugar Company, Spreckels.

THE sugar beet nematode is now the most serious hazard to successful sugar beet growing. It is gradually but steadily invading the sugar beet lands of California. Some of the most highly productive lands are showing the characteristic symptoms of crop injury caused by the ever-increasing population of nematode.

There is some question whether the nematode is native and has increased through the growing of friendly crops, or was imported from Europe with sugar beet and table beet seed. Dr. A. Schneider, in 1906, examined the foreign matter found in a sack of European beet seed and succeeded in rearing young nematodes from lumps of earth found in the seed.

The life cycle habits of the nematode have to date very well protected this pest from any effective chemical control. Many unsuccessful attempts have been made in the past to develop by selection and breeding a sugar beet plant resistant to nematode.

The sugar beet nematode was observed for the first time in the Salinas Valley in 1906 when it was found on a very few scattered plants in a beet field near Salinas. By 1911 nematode had spread until 450 patches were observed in that year. The seriousness of crop injury was demonstrated at that time by the average weight of diseased beets, which weighed only 2.5 ounces compared to 36 ounces average weight of healthy beets in the same field.

The nematode population in the sugar beet lands of the Salinas, San Benito, and Pajaro Valleys continued to gradually spread by too frequent sugar beet cropping, growing of host crops in rotation with beets, and the careless movement of machinery and equipment from ranch to ranch, until 1927.

By 1928 the Salinas area sugar beet growers were discouraged by the almost continuous crop destruction by leafhoppers, and refused to continue to grow sugar beets. The **total** sugar beet acreage in Monterey, San Benito, Santa Cruz, and southern Santa Clara Counties in 1928-29-30 and 31 was only 2,428 acres. This drastic reduction of sugar beet acreage over a four-year period and the farming of these lands to non-host crops made a tremendous natural reduction in the nematode population.

Leafhopper control and progress in resistant seed made sugar beet growing popular in the tri-county area again in 1932 and from this date to 1940 large acreages were grown each year with a minimum of nematode crop damage. In 1932 a crop history for all sugar beet producing land in the area was established by the Agricultural Department of Spreckels Sugar Company. From this date to 1940, known nematode lands were not contracted for sugar beet growing. Crop rotation was compulsory to secure a sugar beet growing contract. Since 1940, the sugar beet growing situation in the Salinas Valley has been so complicated by competition for acreage that nematode policing of sugar beet lands has become impossible except in extreme cases. The nematode now is the most serious hazard to successful sugar beet growing—grim evidence of the folly of ignoring the nematode histories accumulated since 1932.

NEMATODE HISTORY CARD

Location (Legal Description) Landowner

CROP HISTORY	REMARKS	RECOMMENDATIONS
1949		
1950		
1951		
1952		
1953		
1954		
1955		
1956		
1957		
1958		
1959		
1960		

See map on reverse side

FACSIMILE of the nematode history card used in the Woodland District of Spreckels Sugar Company.

Progress is being made in chemical soil treatment by fumigation for nematode control. Until this chemical control becomes a reality, crop rotation and other cultural practices will allow the continued production of satisfactory sugar beet crops in any nematode infested area.

I CROP ROTATION

Fields known to be infested should only be planted to sugar beets once in four or five years. Sugar beets should not be planted on non-infested land more often than once in three years. All rotation practice should be with non-susceptible crops.

To clarify the relation of various crops to nematode susceptability, a table is given below. Here are tabulated various crops, classified as:

1. **Host Plants** — crops on which the nematode completes its life cycle and increases in numbers.
2. **Neutral Plants** — crops which are not hosts, but which are not detrimental to nematode.
3. **Hostile Plants** — crops which supply no food to the nematode, but which stimulate the release from the cysts embryos which will later starve.

1. HOST PLANTS	2. NEUTRAL PLANTS	3. HOSTILE PLANTS
Beets	Alfalfa	Alfalfa
Broccoli	Barley*	Alsike Clover
Brussels Sprouts	Beans	Chicory
Cabbage	Celery	Corn
Cauliflower	Clover	Flax
Mustard Seed	Corn	Horse Beans
Radish	Garlic	Red Clover
Rutabaga	Hemp	Rye
Spinach	Lettuce	White Clover
Turnips	Potatoes	
Weeds (not all, but most prevalent species)	Oats*	
	Onions	
	Safflower	
	Tomatoes	
	Wheat*	

* Fields planted to these grains are usually hosts to nematode because of the presence of wild mustard.

From a practical farming standpoint, crops in-included in the third group would be first choice for rotation crops. Crops in the second group should be used in long rotation practices, and those in the first group should be carefully avoided.

(Continued on Page 40)

DAIRY FEEDING FOR MAXIMUM MILK PRODUCTION

By AUSTIN ARMER
Agricultural Engineer, Spreckels Sugar Company

FEEDING molasses dried beet pulp as a supplementary dairy ration is too common a practice to be news. But when a large dairy herd outyields the national average for butter fat production by 150%, "What were they fed?" becomes a fair question.

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AL CLARK (left) and Roy Marzorini.

Al Clark and Roy Marzorini are partners in a model dairy operation near Paso Robles. Their record of 511 pounds of butter fat per year, (average production for 94 cows) suggested that a good deal of attention had been paid to the feeding schedule.

MANAGEMENT PAYS OFF

Overall good management is what Mr. Clark credits for his profits. This includes the philosophy that "Burning Out" his cows with forced milk production is penny wise and pound foolish. That is why a relatively low protein concentrate is used to supplement the alfalfa hay. Roy Marzorini reports the following daily feeding schedule:

	For 94 Cows	Per Cow (Average)
Alfalfa Hay	3300 lbs.	35.0 lbs.
*Dairy Feed (16% protein)	600 lbs.	6.4 lbs.
Molasses Dried Beet Pulp	450 lbs.	4.8 lbs.
Total Concentrate	1050 lbs.	11.2 lbs.

* Ingredients: Cocoanut Meal, Orange Pulp, Ground Grain Screenings, Cottonseed Meal, Cane Molasses, Rolled Barley, Wheat Bran, Linseed Meal, Limestone Flour, Steamed Bone Meal, Salt and Potassium Iodine.

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THE CLARK and Marzorini herd near Paso Robles. The 150 acres of alfalfa in the background supply the basic feed.

The concentrate is fed twice daily at milking time. Roy Marzorini treats his cows as individuals. In addition to the ranch brand, each animal is branded with a number, so that there is no difficulty in identifying each cow and feeding her according to her individual needs. The schedule of concentrate feeding is as follows:

Milkers at low production.................One Scoop
Milkers at normal production.........Two Scoops
Milkers at peak production.............Three Scoops

Each scoopful of concentrate has an average weight of 2½ pounds.

CONCENTRATE PROTEIN NOT HIGH

The mixture of 600 pounds of 16% protein dairy feed with 450 pounds of molasses dried beet pulp (6% protein) has a resultant protein content of 11.7%. This is somewhat less protein concentration than usual, but Mr. Clark believes in "a long life and a happy one" for his cows, and claims a higher percentage of productive time during the cows' life than if production were forced with high protein concentrates. Further advantages claimed for the molasses dried pulp are improved digestion due to reduced compaction, and a conditioning effect of the molasses (maintaining of high blood-sugar concentration).

Palatability of the concentrate is increased by the addition of molasses dried beet pulp, and palatability is more than an esthetic quality. "When the concentrate tastes good, the cows eat more," says Al Clark.

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LUNCH TIME. Each cow averages 35 pounds of this alfalfa hay daily with an 11 pound supplement of concentrate (at milking time), in which molasses dried beet pulp is an important ingredient.

BALED BEET TOPS ARE A LOW COST DAIRY FEED

By JOHN LEAR

Agricultural Superintendent, Spreckels Sugar Company

THIS REPORT on the successful baling and feeding of sugar beet tops to dairy cattle also serves to introduce two new Spreckels growers at Los Banos—John and Joe Freitas.

In 1949 the Freitas brothers grew 30 acres of sugar beets which yielded over 20 tons of beets per acre, and a total of 65 tons of baled, cured, beet tops. This 65 tons of baled beet tops was the reward for the determination to realize a double return from their beet growing operation.

The field was harvested by hand, and hand labor was employed to fork the tops into windrows. After a preliminary curing these windrows were turned with a side delivery rake. Much of the windrowing and curing labor was contributed by the Freitas Brothers in order to minimize their cash outlay. They also supplied their own 3-wire baler.

UTILIZATION OF BALED BEET TOPS

After baling, these beet tops were fed to winter dry cows and heifers. Had there been a greater supply of baled beet tops, the Freitas Brothers would have fed them to milk cows as well. The daily ration was approximately 20 pounds of the baled beet tops along with 5 pounds of alfalfa hay. The actual amount fed was that which the animals would clean up.

The Freitas Brothers are veteran dairymen and it was evident to them that the animals fed on baled sugar beet tops wintered better and attained greater size than had been customary during the feeding of alfalfa hay alone. The cost of weight gain, which is the basis of all feeding studies, was lower in 1949 than in the previous years when alfalfa hay was the sole ration. In former years the cost of hay, supplemented by a light grain addition, had been a heavy item of expense, especially since hay prices tend to rise during the winter months.

To form some idea of the actual cash value of baled feet tops compared to hay,, the price of alfalfa has been assumed at $25 per ton . Baled beet tops in good condition are so similar in nutritive value, that they have also been considered worth $25 a ton in this comparison. A tabulation of costs follows:

ALFALFA HAY		BEET TOPS	
		Curing, baling and stacking.	$ 9 per ton
		*Pasturing loss	3 per ton
(baled and delivered to dairy)	$25 per ton	Total	$12 per ton

* Since the beet tops, if pastured, are worth about $6.00 per acre, and since the yield of baled tops was 2 tons per acre, the baled tops must be charged with the $3.00 per ton which might otherwise have been recovered by pasturing.

Two conclusions may be drawn from this report. The first is that by actual experience the nutritive value of baled beet tops has been demonstrated. The second is that at an expense of $780.00 (almost all of which was represented by labor rather than cash outlay), 65 tons of valuable feed were recovered, worth a total of $1625.00.

The Freitas Brothers have demonstrated that a little foresight and extra labor can yield a large, extra dividend from a beet contract. In their case, the dividend amounted to $54.00 per acre.

This report has not gone into detail on methods of baling beet tops. While such methods are becoming fairly well standardized, each grower will find that his own situation dictates the procedure. For a more detailed description of top-baling methods, the reader is referred to the SPRECKELS SUGAR BEET BULLETIN, Vol. XIII, No. 4 and Vol. XIII, No. 6 (July-August and November-December, 1949.)

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BALING was done by the Freitas Brothers, using a baler of the type shown.

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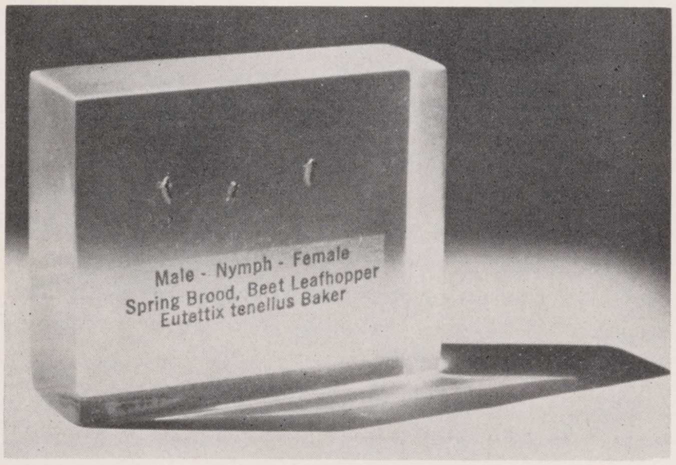
HEIFERS and dry cows thrived on the baled beet top diet.

CURLY TOP DAMAGE CONTROLLED IN SPITE OF RECORD HOPPER OUTBREAK

By E. A. SCHWING
Entomologist

THE 1950 outbreak of Eutettix tenellus (Circulifer tenellus) has been the most serious since the 1925 disaster caused by this insect. It has been far the most serious attack since control operations commenced in 1931.

Proof of the intensity of the outbreak has been the amount of damage to such crops as tomatoes and melons, crops which do not have the resistance of the present sugar beet varieties. In the San Joaquin Valley, many early tomatoes were completely destroyed, and the average loss to the tomato crop was at least fifty per cent. Honeydew melons were similarly attacked, and other melons to a lesser degree.



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PLASTIC BLOCK contains specimens of beet leaf hoppers. These skillful mountings were prepared by H. H. Keifer, Bureau of Entomology, California State Department of Agriculture. (Natural size).

Sugar beets, for a number of reasons, suffered relatively little damage. The foremost reason was the use of the highly resistant variety, U. S. No. 22. Second was the combination of early planting in the most dangerous areas, excellent agricultural practices, and timely crop spraying. A third factor toward reducing crop damage was the beet leafhopper control program carried on by the State Department of Agriculture.

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THIS IS the type of damage seen in the worst cases of blighted fields in 1950. Without the control factors discussed in this article, this field would have been a total loss.

WHAT MIGHT HAVE HAPPENED

If there had been no resistant seed, if outmoded cultural practices had prevailed, and if there had been no control program, a crop reduction of 50 per cent would have been a certainty.

The actual damage to the sugar beet crop in northern California will average somewhere around two and one half per cent for 1950—only one twentieth of the destruction that might have occurred. The three factors responsible for this remarkable saving can be evaluated approximately as follows:

The Use of Resistant Varieties	40%
Improved Cultural Practices	30%
Control Measures by State Department of Agriculture	30%

WHY 1950 WAS A BAD YEAR

State control operations were less effective than in recent years due to a combination of circumstances difficult to combat. Since 1943, a series of dry years has plagued the San Joaquin Valley. Barren areas have developed on plains and foothills, increasing the Russian thistle host plant for overwintering insect propagation. Vegetation covering the foothills decreased, thus favoring winter and spring survival of the beet leafhopper. This series of dry years was climaxed in 1948 when practically no rain fell in the west San Joaquin up to March 1. The covering plants were reduced to a large extent by the drying of the original winter plants before they could seed. Later copious rains sprouted all of the Russian thistle seed and carried the acreage into the fall. An estimated total of 50,000 acres with a heavy stand of Russian thistle was found in the west San Joaquin in 1947. In the same area, a total of 200,000 acres had developed in 1948. This was followed by an even larger acreage in 1949 and in 1950.

WHAT DOES THE FUTURE HOLD?

Fortunately, because of the lack of late spring rains (such as occurred in 1948 and 1949) there is a current indication that all but 50,000 acres of the present west San Joaquin Russian thistle acreage will dry up before September 1. This will bring us back to the 1947 Russian thistle acreage and will give us an opportunity to again reduce permanently the Russian thistle acreage in the strategic areas.

The fringe of Russian thistle within a twenty mile radius of the west San Joaquin foothills has always furnished a disproportionate share of the overwintering beet leafhoppers, and it has been proved that the reduction of this Russian thistle to a low controllable level will make possible a cheap and satisfactory foothill control of the beet leafhopper for northern Caifornia.

The present damage in northern California due to the beet leafhopper was expected as early as August 1949. The large green masses of Russian thistle near the west San Joaquin foothills persisted all through the late spring, the summer, and into the fall with

enormous numbers of beet leafhoppers developing during the fall months. A considerable block of Russian thistle near the Panoche was sprayed before the fall rains started and this timely work resulted in greatly reducing the number of spring brood beet leafhoppers that finally reached the Delta and Sacramento Valley. More work of this nature should have been carried on, but funds in the rigid budget did not permit such extra operations.

Another unexpected condition that cut the spraying efficiency occurred in the Coalinga sector. Temperatures of from 90 to 100 degrees Fahrenheit were prevalent during the flight period into the Coalinga canyons. Temperatures are normally around 70 degrees at this time and bug movements are short, allowing spraying of concentrations on perennials. Very large numbers flew past the usual areas and the favorable winter built up an exceptionally large spring brood in this area.

Other increases in Russian thistle are due to the change in the method of moving sheep. Instead of driving them long distances on foot, they are conveyed to foothill destinations in trucks. Seed carried in the wool can easily spread over the foothill areas. The war practice of plowing up summer fallow land which often does not produce a grain crop, but does produce Russian thistle, often starts up large acreages near the foothills. The development of the Central Valley ditches with their large barren soil areas has also increased the Russian thistle acreage in formerly clean areas.

An effective control of the Russian thistle acreage to a point where it can be adequately controlled with small effort from year to year is obviously the best means of keeping down the beet leafhopper population. For 1950 this should be demonstrated clearly, as a very large sum of money is to be devoted to spraying all of the strategic large acreages of Russian thistle that are developing the overwintering brood for the San Joaquin Valley. The results obtained for this year should be nearly as good as if all of this Russian thistle were destroyed.

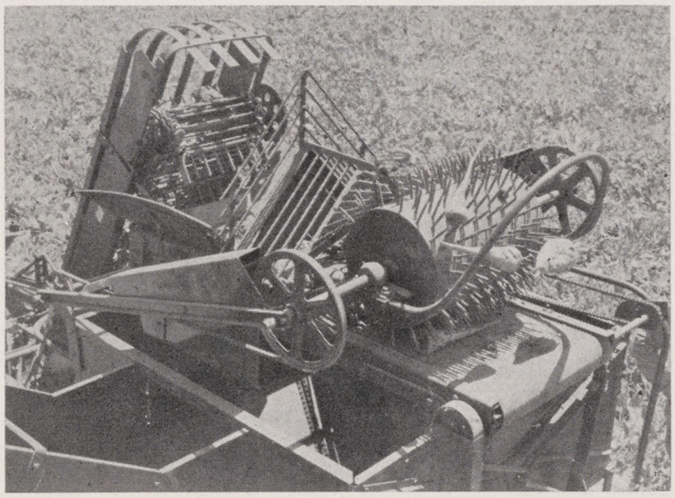
The 1950 outbreak has proved that the sugar beet industry can produce a very good crop in the presence of beet leafhopper numbers that were formerly fatal. But it also proved that a considerable saving is still possible if a good control program is carried on in the San Joaquin Valley. Besides saving in crop damage, saving in crop spraying costs are also well worth while.

NEW ATTACHMENTS INCREASE EFFICIENCY OF INTERNATIONAL BEET HARVESTER

OWNERS of International (McCormick-Deering) Model HM1 beet harvesters should acquaint themselves with two devices, new in California, but with a full season of good performance to their credit in Idaho and Colorado.

The Florson-Matic Sorter is an attachment to the sorting belt which will put over 90% of the beets into the trailer cart without manual help. Good practice would be to eliminate both sorters, but let one man walk behind the cart, where he can pick up all missed beets. The Florson-Matic sorter will miss some, and a few are usually spilled by the plow guards. The single pick-up man can easily get them all. Beware of using the Florson-Matic in exceptionally dry or cloddy fields—a lot of clods may show up in the load.

The Parma Beet Cleaner does more than its name implies. Perhaps it should be called "Beet Saver", because it makes a substantial reduction in topping loss. The Parma machine is a miniature beater which operates behind the regular HM1 disk topper. The important feature is that the disk topper is adjusted to barely skim the beet crowns—the Parma does the rest. The result is that all beets are scrubbed to a truly "bald-headed" finish—lacking the tuft of fibers or stems usually left by a beater operating alone. The important feature is that growers receive payment for several per cent of their beet crop previously wasted in crowns.



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FLORSON-MATIC Sorter for the McCormick-Deering HM1 beet harvester.

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PARMA Beet Cleaner for the McCormick-Deering HM1 beet harvester.

NEMATODE CONTROL

(Continued from Page 34)

EARLY PLANTING HELPFUL

Early planting is another very important factor in reducing the severity of attack by this nematode. Some nematodes are left in the soil even after a full rotation program. To minimize their effect on the beet crop it is advisable to plant the beets as early as possible. This will enable the beets to become well established before the nematodes become active in numbers enough to cause damage.

NEMATODE SPREAD CAN BE CONTROLLED

There are a number of ways in which sugar-beet nematode can be spread to uninfested fields. Soil carried from an infested field on farm implements provides an opportunity for the nematodes to spread to any fields which the machinery might enter. Consequently thorough cleaning of equipment before it leaves a harvested field would be a necessary precaution in preventing the spread of this nematode.

Tare dirt often contains cysts with potentially infective larvae and should never be carried back to cultivated fields.

It is possible that movement of livestock could carry infestations from one field to another in soil clinging to their feet. However, the nematodes cannot survive passage through the digestive tract of livestock.

Irrigation water contributes to the spread of the nematode within a field. Land-levelling operations which move large amounts of soil will distribute nematodes throughout a field where it may have been confined to one or more localized spots.

When beets from an infested field have been processed the wash water undoubtedly carries many nematodes to the settling ponds. If these settling ponds should be reclaimed for agricultural use, they will infest any future crops.

The widespread distribution of this nematode and its ever-present menace to clean land brings up the recommendation often made for crop rotation on uninfested fields. Although this is not essential in beet production, and must be left to the judgment of each grower, it can certainly be considered as good insurance since it minimizes the build-up and importance of any infestations that might be brought into a field.

In considering the control of the spread of this nematode an important question is whether or not the sugar-beet nematode is native to this country. So far there is no direct evidence that it occurs naturally in California, and as far as is known the most important factors that affect its spread are those discussed above.

The continued spread of the sugar-beet nematode can be prevented or at least delayed and minimized. To accomplish this it is going to be necessary for growers, harvesters, truckers and processors to stop taking chances and observe every precaution that will help keep this nematode out of clean land and reduce losses in infested fields.

NEMATODE IN SALINAS

(Continued from Page 35)

II CULTURAL PRACTICES

These include early planting, proper fertilization and irrigation, and timely weed control. Do not attempt to grow sugar beets on land known to be infested with nematode. If the presence of small nematode areas in a field is suspected, then plant early, on a well-prepared seed bed, fertilize generously (with pre-plant, side dressing and soluble fertilizer in the irrigation water) and use frequent light irrigations. Maintain fields clean of weeds and start an extended crop rotation plan the following year.

The sugar beet farmers of Europe have lived with the nematode problem for the past fifty years and have learned to avoid the pest and continue to produce successful crops of sugar beets. The problem of the California sugar beet grower is to learn to live with the nematode until the manufacturers of chemical fumigants produce a successful killing agent which can be used at reasonable cost on all soil types for nematode destruction.

In short, the growers and land-owners of California have at their command enough weapons to win the battle against sugar beet nematode. But the battle will be won only if these weapons are used constantly—and with an intelligent, long range attitude which tolerates no sacrifice of future values for immediate profits.

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.

AUSTIN ARMER, Editor
600 California Fruit Building
Sacramento, California

SPRECKELS SUGAR BEET BULLETIN

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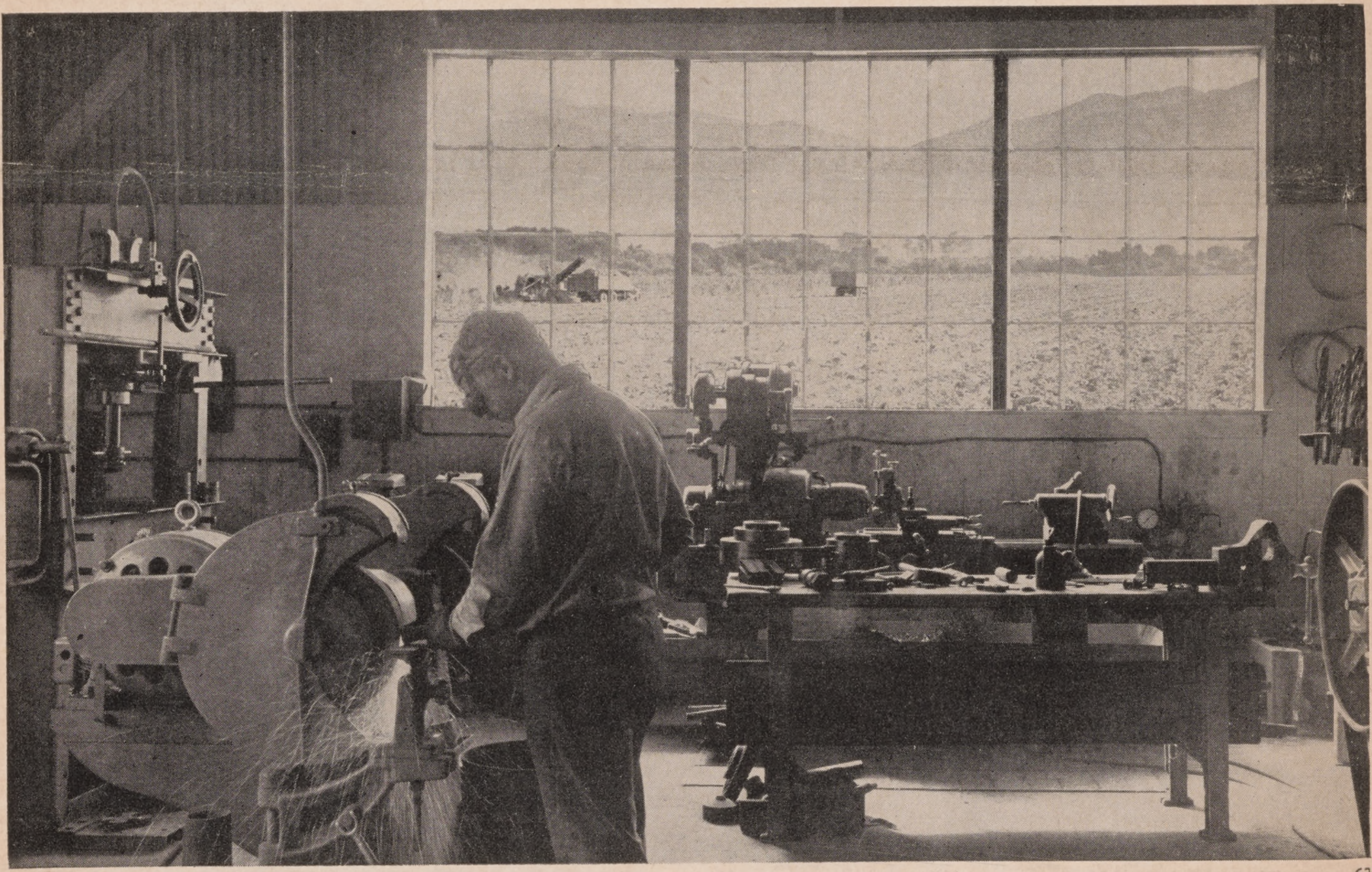

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FARM MECHANIC

California sugar beet growers traditionally build their own equipment for their special needs.

SEED BED PREPARATION
GROWING THE CROP
HARVESTING

are some of the operations that have been mechanized with farmer-built tools. See page 46

FACTORS AFFECTING SUGAR YIELDS IN THE WOODLAND AREA

By F. J. HILLS

Agronomist, Spreckels Sugar Company

Within any locality where sugar beets are grown it is characteristic that yields and sugar contents fluctuate markedly from field to field in the same season. This is particularly true of the Woodland area, where despite many natural advantages of soil and climate, relatively low yields and (or) sugar contents frequently occur. At the same time other fields in this area produce large tonnages with high sugar contents. Deeply concerned with this situation, Spreckels Sugar Company initiated an investigation aimed at accounting for low yields in this area, which is potentially capable of excellent sugar production.

During the 1949 crop season a survey* was undertaken as a preliminary step in determining some of the factors responsible for poor sugar beet crops in this locality. This survey involved the intensive investigation of fertility through the use of plant tissue analysis and the broad evaluation, by critical field observation, of other factors which might be of major importance. Among these were soil moisture, plant population, disease and insect damage, and cultural practices.

About thirty fields were selected for the survey. Leaf samples were collected from each field at three week intervals. The stems or petioles were cut and dried and sent to the Division of Plant Nutrition, University of California at Berkeley where analyses were made for nitrate nitrogen, phosphate phosphorous, and potassium. This technique of plant analysis has been developed through research and practical use to where it can be used to evaluate the adequacy of the supply of the major plant nutrients; nitrogen, phosphorous, and potassium. Critical nitrogen levels (2) have been rather definitely established for the concentration of nitrate-nitrogen in dried petiole material. It has been shown that when the concentration of nitrate falls below a critical range that the growth rate of the plant will decrease. Tentative critical levels have also been established for phosphate-phosphorous (1) and percent potassium (unpublished data of Albert Ulrich). Thus, it is possible, through periodic sampling of a group of fields, to evaluate which nutrients are in short supply and may be causing reduced yields. Figure 1, from a field experiment in the Woodland area (2), illustrates a response to nitrogen and the relation of beet yields to the nitrate content of petioles.

At each visit to a field, careful notes were taken in accordance with a check-off list on: irrigation (i.e dates, drainage, timeliness, water penetration), general appearance of the crop (color, vigor, wilting), weeds, diseases and pests, cultural practices, and other factors which were observed that might have had an effect on yields.

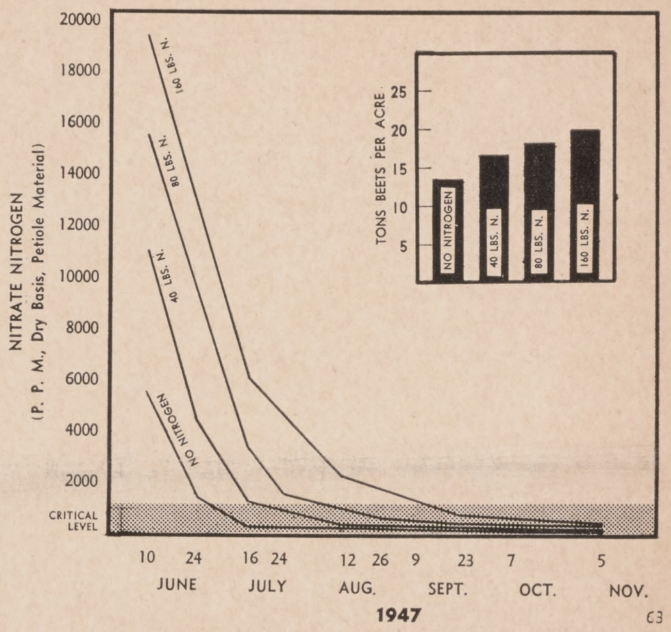

Fig. 1. Maximum yields were obtained when Nitrate Nitrogen remained above the critical level until shortly before harvest (after Ulrich).

Crop and soil treatment histories, for the previous four years as well as for the current season were recorded. Stand counts were made on each field after thinning and again just prior to harvest. After harvest, the records collected for each field were summarized and evaluated as to the most important factors contributing to the final yield and sugar content. Following is a listing of these factors.

NON-NUTRITIONAL FACTORS

1. Inadequate plant populations or failure to establish a stand.

(a) The practice of flat planting and dependence on rain to germinate seed frequently resulted in the necessity of replanting. When replantings were made on beds it often was impossible to secure a good stand because of uneven land, making it impossible to irrigate as carefully as is required for germination. Figures 2 and 3 illustrate contrasting situations in regard to establishing a stand.

(b) In several fields, particularly those planted late and irrigated for germination, damping off was important in reducing potential stands. **Rhizoctonia solani** and **Pythium aphanidermatum** were the fungi causing the most damage. The combination of high temperature and ample moisture when the seedlings are emerging presents an environment which is particularly favorable for the development of these organisms. Under these conditions seed treatment frequently fails to provide adequate control.

(c) Poor thinning is another important reason for inadequate plant populations. Good labor, well supervised, is essential to the successful accomplishment of this operation.

2. Late planting. Full advantage of the growing season is often lost when planting is delayed. The

(Continued on Page 44)

* This survey was undertaken by the Spreckels Sugar Company in cooperation with the Sugar Beet Development Foundation and Dr. Albert Ulrich, Division of Plant Nutrition, University of California.

Fig. 2. A spotty stand resulting from partial germination from soil moisture followed by subsequent emergence after rainfall.

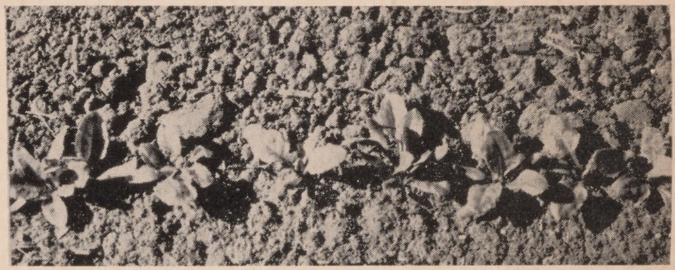

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Fig. 3. A uniform stand resulting from precision planting into dry ground and irrigation for emergence.

Fig. 4. Severe infestation of sugar beet nematode has completely destroyed the crop in areas of this field.

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Fig. 5. This field is less than two miles from the field shown in Fig. 4. Proper rotations preceded this beet crop, which shows no nematode damage.

Fig. 6. These beets were completely hidden in water grass. Roto-beating was resorted to as a means of reducing competition.

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Fig. 7. Water grass germinated in this field, but was controlled, largely by confining irrigation water to deep furrows between beds.

Fig. 8. This recently leveled field settled in a filled area. Irrigation for germination resulted in poor stand due to crusting and cracking.

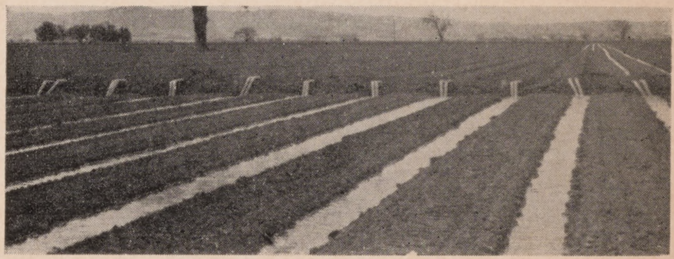

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Fig. 9. This field was planted a year after leveling. The soil was firm but permeable; the slope adequate and uniform.

late establishment of stands was frequently associated with dependence on rainfall for moisture for germination. When rain does not come at the proper time an inadequate or spotty stand is the result. Many fields were replanted one or more times because of the dependence upon chance rainfall.

3. Disease. Sugar beet nematode is at present one of the principle factors limiting production in the Woodland area. Too little attention is given to simple basic control measures such as proper rotation, weed host eradication, and the cleaning of equipment used in infested fields. Fields are frequently planted to susceptible crops several years in succession resulting in the build up of the nematode population to a point where it is impossible to grow a profitable sugar beet crop. Figures 4 and 5 illustrate this point. This near crop failure is the result of too many susceptible crops without proper rotation.

Wet root rot, dry rot canker and southern sclerotium root rot were factors reducing yields in a few instances. Better water control, adequate nitrogen fertilization and rotation could, in most cases, reduce this damage.

4. Weeds. Weeds, particularly water grass, increase costs as well as reduce yields. Figures 6 and 7 illustrate a bad (but all too common) water grass infestation contrasted with a clean field.

5. Poor Irrigation. A major problem is that of irrigation. Its effects have already been mentioned as related to establishing good stands. In many fields poor water distribution later in the season results in plants in many spots wilting from a lack of adequate soil moisture and the "drowning-out" or "rotting-out" of beets because of excessive water in other places. The problem of land leveling in this area is a simple one compared to other areas of California. With comparatively little effort many fields could be leveled so that proper water distribution would be possible. Figures 8 and 9 contrast the effects of irrigating for germination on unlevel and level fields.

Frequently the failure to apply timely irrigations results in serious wilting of the plants for prolonged periods, with consequent irreparable damage.

6. Alkali Soils. Two of the fields which were included in the survey because of their previous record of low yields were found to be seriously affected by black alkali. There has been little attempt in this area to reclaim many of these soils and there is very little appreciation of proper reclamation methods.

NUTRITIONAL FACTORS

1. Nitrogen. This element plays a highly important part in the sugar beet production of this area. Better use of nitrogen fertilizer could contribute substantially to increased production.

Plant analyses indicated many cases of nitrogen deficiency early in the season. Figure 10 shows the nitrogen curves of two typically deficient fields as compared to two fields well supplied with nitrogen. While it is true that there were differences other than nitrogen between these fields that affected production, it is very likely that nitrogen was a major factor contributing to the low yields.

When sugar beets are under a high nitrogen environment at harvest time the sugar percent is always lower than if the crop had had sufficient time to use up most of the available nitrogen.

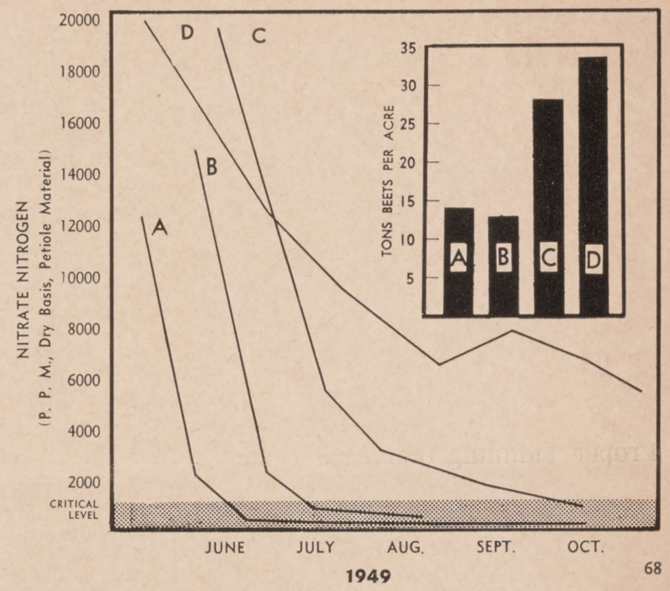
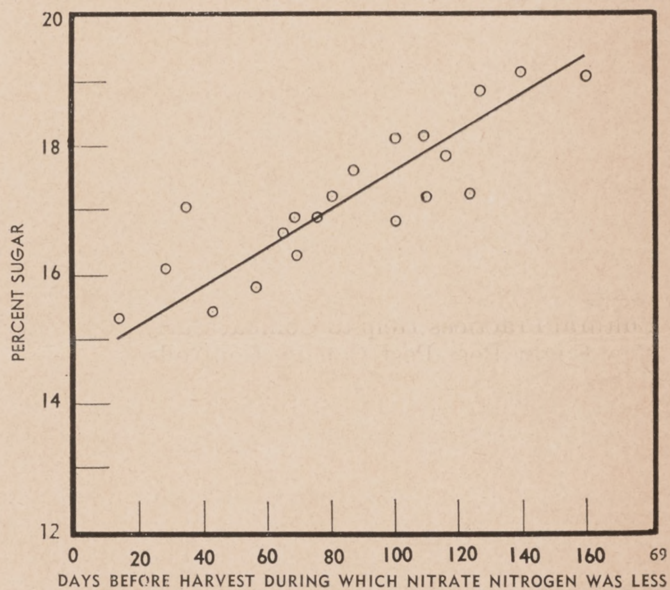


Fig. 10. Fields A and B fell below the critical level of Nitrate Nitrogen long before harvest time. Fields C and D remained above the critical level until harvested.

Evidence of the importance of the role this element plays in affecting sugar concentrations in the Woodland area is presented in figure 11. By using plant analysis to indicate the nitrogen status of the fields and plotting the number of days each field was low in nitrogen prior to harvest against the resulting sugar percents, a highly significant correlation is obtained. When this correlation is considered in the light of the many differences between these fields, all of which could have had an effect on sugar storage, it points strongly toward the conclusion that nitrogen must be one of the principle factors influencing sugar content.



DAYS BEFORE HARVEST DURING WHICH NITRATE NITROGEN WAS LESS THAN 1000 P. P. M. (CRITICAL LEVEL). CORRELATION COEFFICIENT .72.

Fig. 11. Plant analysis reveals that maintaining high nitrogen levels as long as possible is necessary to produce maximum sugar content at harvest time.

This, of course, does not mean that long periods of nitrogen deficiency prior to harvest are desirable. The objective of sugar beet production is the maximum yield of sugar per acre. Many times slightly lower sugar percentages are more than offset by increased root yields. It does mean, however, that there are good possibilities, through more efficient nitrogen fertilization, of improving sugar contents at high yield levels.

2. Phosphorous and Potassium. The survey indicated little possibility of increasing yields through the use of phosphorous or potassium fertilizers. However, work in this area with other crops has shown that applications of phosphorous early in the season may be advantageous to seedling vigor.

In the general application of plant analysis certain precautions should be exercised. The technique can only indicate nutritional deficiencies. It cannot tell how serious the deficiency is or how much fertilizer should be added or the magnitude of response to expect when the deficiency is corrected. However, the earlier in the season at which the deficiency occurs, the greater is the possibility of increasing yields through heavier fertilization. It would be highly desirable to use such a tool as a basis for recommending supplemental fertilizer applications. Its use for such a purpose would depend a good deal on experience and familiarity with the technique within a given area. This and other studies indicate that it may be possible to use plant analysis in this way thereby improving root yields and sugar contents.

CONCLUSIONS

The results of this survey indicate the following general conclusions:

1. The failure of this area to fully put to use approved farming practices is a major obstacle to increased yields. Water use is of primary importance among these practices and could be greatly improved by: (a) land leveling, (b) bed planting, (c) more timely application.
2. Plant populations are frequently too low for maximum production.
3. Sugar beet nematode is one of the principle factors limiting production.
4. Weeds, particularly water grass, are serious in many fields causing reductions in yield and greatly increased costs of production.
5. Lack of nitrogen is the predominating nutritional deficiency occuring in this area. Many fields are inadequately fertilized for maximum yields.
6. Nitrogen is an important factor in causing fluctuations in sugar content.
7. There is a good possibility that plant analysis can be used to advantage in improving fertilization practices so as to increase sugar production.

References

1. Ulrich, Albert. 1948. Plant analysis as a guide to the nutrition of sugar beets in California. Proc. Amer. Soc. Sugar Beet Technol. 1948.
2. Ulrich, Albert. 1950. Critical nitrate levels of sugar beets estimated from analysis of petioles and blades, with special reference to yields and sucrose concentrations. Soc. Sic. 69:291-309.

THE ROLE OF PLANT BREEDING IN SUGAR BEET PRODUCTION

By RUSSELL T. JOHNSON
Plant Breeder, Spreckels Sugar Company

Have you ever looked closely at a field of sugar beets? If you have you probably noticed the great amount of variability among individual beets. There are wide differences in size, shape, color and number of leaves, as well as size and shape of root. In addition to those visible differences, there are also differences in the chemical composition of individual sugar beets. For example; suppose a load of beets was delivered to the receiving station and the sample indicated the sucrose percentage to be 17.0. This figure represents an approximate average sucrose percentage of all the beets in the load. However, if individual beets were tested, they would probably range between 14.0 and 20.0 percent sucrose.

This variability is due to a combination of both the environment and the genetic potential of each beet. By environmental variability is meant the differences due to conditions outside the plant itself, these being chiefly soil, moisture and fertilizer. Control of this type of variability is attempted by proper cultural practices. Genetic variability is that which is inherited and transmitted from generation to generation through seed production. Control of this type of variability is attempted through the development of improved varieties.

SUGAR BEET VARIETIES

It is mainly the development of these improved varieties with which the plant breeder is concerned. In general, the sources of improved varieties are selections within already adapted varieties and crosses between desirable plants of varieties now available. By selecting within a variety it is often possible to improve upon the desirable characters already in that variety. By making crosses between varieties it is often possible to combine into one

(Continued on next page)

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GREENHOUSE projects speed the solving of many genetic problems.

BEET GROWERS BUILD THEIR OWN EQUIPMENT

By AUSTIN ARMER
Agricultural Engineer, Spreckels Sugar Company

This title is apt to provoke the question, "What's wrong with factory-built implements?" In answer, there's nothing wrong with factory-built implements. Some of them—tractors in particular—are the backbone of California agriculture but they just don't all fit the special needs of California beet growers.

Beet growing is a fairly specialized part of California agriculture, differing in equipment needs from other crops, and even differing from district to district. Thus, the incentive for the "build-your-own" tradition among beet growers lies in these specialized needs.

To meet these needs, growers have displayed a lot of ingenuity, and construction difficulties are shrugged away with a nonchalance that sometimes astonishes visiting engineers from the big implement manufacturers. In fact, the shop facilities of some growers compare favorably to the experimental shops of the manufacturers.

Some growers, of course, have less pretentious shop facilities but are not lacking in ideas. This group is adequately served by the local welding or machine shop. Yesterday's cross-roads blacksmith shop has come of age, and is manned by skilled machinists and welders. The quality of their workmanship usually meets or exceeds the standards of quantity manufacturers, and their knowledge of local conditions and requirements is an important asset.

The photographs on the opposite page are random snapshots of equipment seen here and there in the Spreckels Sugar Company districts. There are doubtless many more which have not been seen or reported. These are just a sample, and it is hoped that growers can get some ideas from these gadgets. Above all, it is hoped that growers will continue to think up improvements in beet tools and put their ideas to work at increasing the efficiency of beet production.

PLANT BREEDING

(Continued from Page 45)

new variety the desirable characteristics of both parental varieties.

In determining varieties of sugar beets with which to begin a program of selection or improvement of any type, the desired characteristics of the new variety to be produced should be considered. For example; if resistance to curly-top is to be the goal, varieties possessing some resistance to curly-top should be used as the selection material. If crossing is to be done, at least one and preferably both of the varieties to be used as parents should possess some resistance to the disease. It is indeed unlikely that a curly-top resistant variety will ever be produced by hybridizing two varieties susceptible to it. If, however, there are beets in a field which have withstood a severe disease epidemic and continue to grow vigorously even though most of the field was heavily damaged, those few vigorous beets might offer a profitable source from which to begin improvement. Plant breeders are not capabble of creating desired new types at will, but the desired type must be available in present varieties, even if only at very low frequency, before they can develop it for commercial use.

The present commercial varieties, in general, represent offspring from composite groups of selected individual mother beets. Those were selected because they possessed certain combinations of desired characteristics. No single variety, however, has all the desired characteristics for all of the various California conditions.

The question might be asked then, "Why have not the most desirable characteristics of our present varieties been combined into one outstanding variety for use throughout the sugar beet growing areas of California?" There are probably several reasons for this, the most obvious being the short time plant breeders have had these desirable varieties with which to work. U. S. 15, one of the older commercial varieties in wide use today has been in commercial use only since 1938 and U. S. 56 only since 1948. This type of research is a process that takes years of careful breeding and subsequent testing to accurately determine the value of each new variety. In this writer's opinion, it is doubtful if a single outstanding variety for use throughout California will ever be developed. With the extreme range of conditions between the different beet growing areas of California, it seems unlikely that one variety could be versatile enough to prove itself superior under all these conditions. It would appear more probable that as varieties become more specialized, local adaptation would become important, necessitating the production of special varieties for specific conditions.

SPRECKELS VARIETIES

Spreckels Sugar Company has now in experimental tests, several of its own varieties. Some of these varieties have shown extreme promise and are being increased for commercial production as rapidly as possible. One variety, S-2, in which high

(Continued on Page 48)

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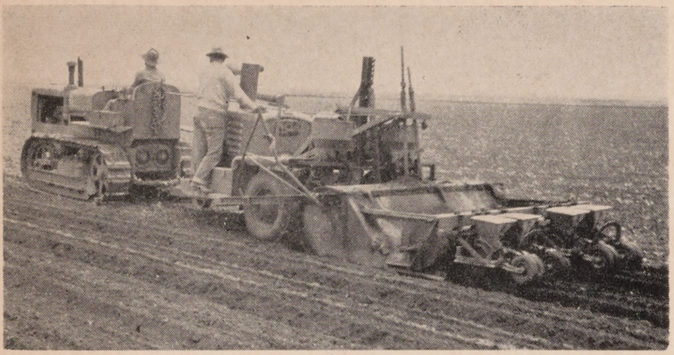
NON-BOLTING varieties developed at the Spreckels plant breeding farm. Present varieties (background) show almost 100% bolting.



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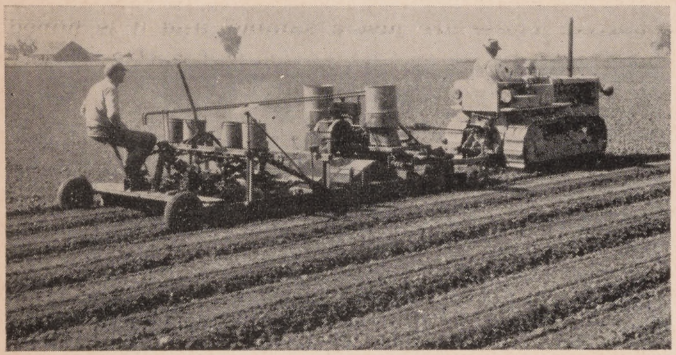
BERT FISK was among the first growers to build a single machine which lists, rotary-tills, fertilizes and plants a beet field in one operation.



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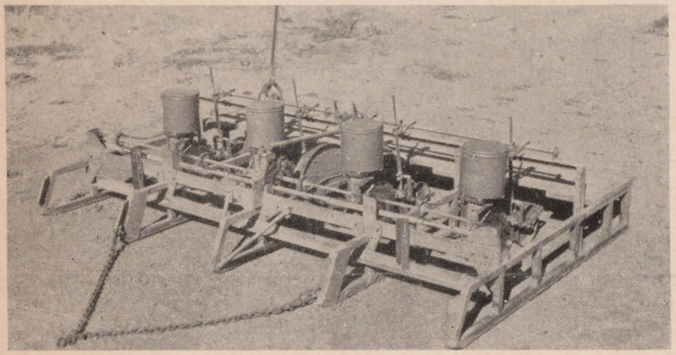
OLIVER ORRICK and FRED TADLOCK built a simplified lister-roto-tiller-fertilizer-planter driven by the tractor power takeoff. Sled mounting makes for straight rows and flat-topped beds.



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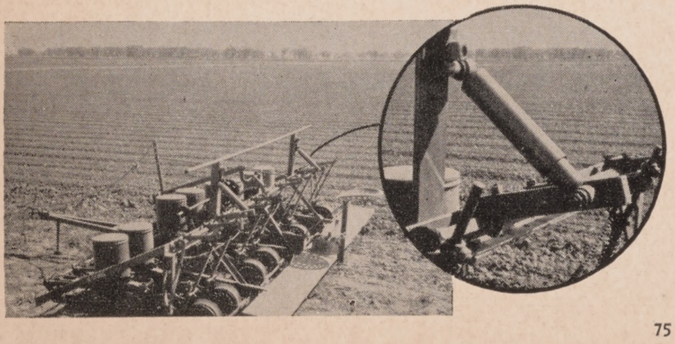
RALPH WEYAND combined the accuracy of a plate planter with the advantages of sled mounting. He even converted John Deere No. 55 planter units into low-drop smooth-tube models similar to the No. 66.



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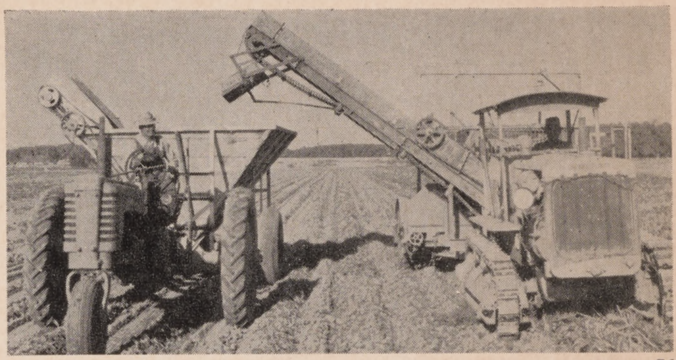
SHOCK ABSORBERS take the jolt from a John Deere No. 66 planter when the units are tripped to start planting. Jerry Fielder of Dixon contributed this useful idea.



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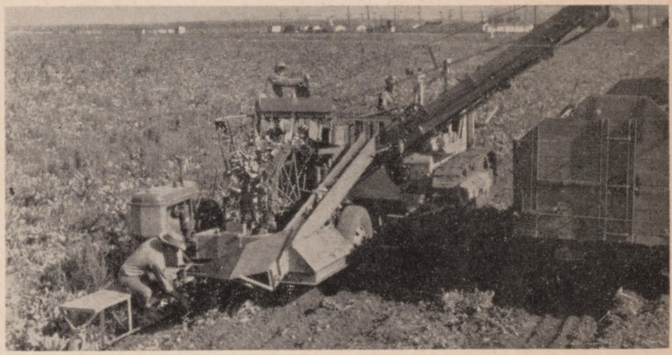
RAY LAUPPE of Grimes solved the "Opening-up" problem of the two-row Marbeet with this 80-inch tread, self-unloading cart.



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MANUEL GULARTE of Soledad has made many useful accessories for his big Marbeet harvester. These include a trailer-bench and auxiliary elevator for the pick-up man, a special disk topper and top windrower.

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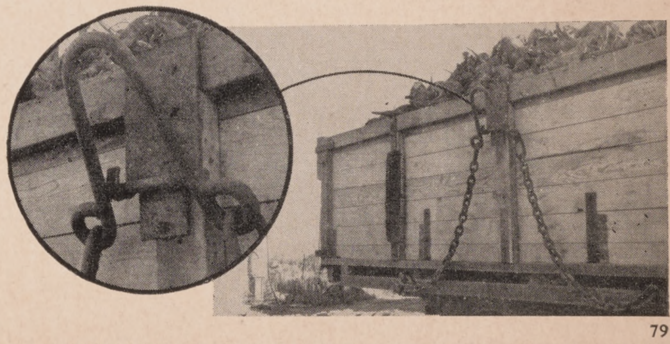
WARREN MORRIS smiles from the cab of one of his four new trucks. He built the beds himself, improving on the designs presented in the July-August, 1946 issue of SPRECKELS SUGAR BEET BULLETIN.



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T. V. CHRISTISON of Woodland has equipped several trucks with this improved chain sling, which speeds unloading and saves damage to trucks (and fingers).

PLANT BREEDING

(Continued from Page 46)

curly-top resistance has been combined with considerable bolting resistance, has demonstrated its superiority in strip plantings this season.

Table I shows the sucrose percentages and yields of the Spreckels variety, S-2 in comparison to the same data for commercial varieties. Only data from the Salinas District are available at this time. The

TABLE I

A Comparison of the Yields and Sucrose Percentage of Spreckels Variety, S-2, With Commercial Varieties in Strip Planting Tests.

Grower	Location	Variety	Sucrose Percentage	Yields in Tons P/A Beets	Yields in Tons P/A Sugar
Soares and King	Greenfield	S-2	15.59	25.04	3.90
		U.S. 15	16.70	21.50	3.59
Martella Bros.	King City	S-2	14.70	36.00	5.29
		U.S. 22	16.33	29.73	4.85
Vincenz Bros.	Greenfield	S-2	17.47	22.49	3.92
		U.S. 22	17.48	21.26	3.71
Ferry Morse Seed Co.	San Juan	S-2	15.68	27.05	4.24
		U.S. 22	16.40	20.89	3.43
J. E. Culver	King City	S-2	15.79	30.16	4.76
		U.S. 22	16.23	25.52	4.14
Kenner and Usrey	San Lucas	S-2	16.71	28.31	4.73
		U.S. 22	16.97	27.80	4.71
Tognetti Bros.	King City	S-2	15.83	31.63	5.00
		U.S. 22	16.19	24.50	3.96
Storm and Farrell	Hollister	S-2	16.10	23.73	3.82
		U.S. 22	16.22	22.06	3.58

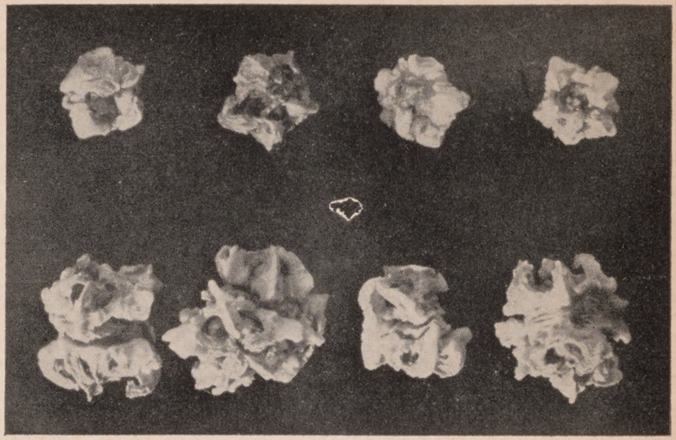
method of harvest in these strip plantings was to harvest equal and adjacent areas of the strip and the variety planted in the remainder of the field. The weight of roots and sucrose percentage of the roots were then determined and the yield of sugar per acre computed. In all cases, the harvested areas of each variety in each field represented approximately .3 to .5 of an acre.

In addition to the figures shown in Table I, in most fields there was considerably less bolting in S-2 than the other variety, especially in the early plantings. Although S-2 exceeded each variety with which it was compared in tonnage of beets and sugar per acre, its sucrose percentage was somewhat lower in every case. A selection has been made in an attempt to increase the sucrose percentage in this variety and still maintain its high yield and bolting resistance.

OTHER BREEDING PROJECTS

Recently two important developments have received considerable attention. They are single germ seed and hybrid varieties. The sugar beet seed used at present consists of a "seedball" usually containing from two to five seeds. If all the seeds in each seedball germinated and grew, it would be impossible to get a stand of single beets, regardless of the precision of distribution of the seed in the row. Sugar beet seed with a single germ per seedball seeded with a precision planter should attain uniform stands of single beets, thus facilitating mechanization in sugar beet thinning.

A few plants were discovered, in an eastern variety, which produced entirely single germ seeds.



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SINGLE GERM seeds (above) compared to seeds of present varieties, with 3 to 6 germs per seedball. A painstaking breeding program must be completed before the single germ characteristic can be combined with other required seed qualities.

Before this character can be used commercially in California, however, it must be incorporated into the varieties adapted to this area. This process is now underway in the plant breeding program of Spreckels Sugar Company.

The production of hybrid varieties of sugar beets has become a practical possibility only in recent years. This has been brought about by the discovery of a type of sugar beet which produced no pollen and was called "Male Sterile." By use of this type of beet in combination with a normal beet which produces pollen, production of 100% crossed or hybrid seed is assured. In crossing beets, both of which produce pollen, only part of the resulting seed is hybrid. The rest is inbred, resulting from self pollination. Plants grown from the crossed seed may show an increase in vigor, but plants grown from the self pollinated seed are reduced in vigor. Thus, the total effect is very little change. Male sterile hybrid varieties have been produced experimentally and with very promising results. Some disease resistance problems and more extensive experimental testing are necessary before such varieties will be commercially available. There are a large number of strains of beets now under observation, at Spreckels Sugar Company's Plant Breeding Farm, for future use as components of hybrid varieties.

The Plant Breeding Program of Spreckels Sugar Company is planned for the production of select varieties adapted to California beet growing areas. Such a program is a continuous, long-range accomplishment with many and diverse problems. As rapidly as specific problems are solved other problems present themselves and require solution. Plant breeding research has accomplished a considerable advance from the varieties in common use twenty years ago, and it seems probable that with similar cooperation with other phases of research, even greater progress is possible in the future.

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.
Mention of specific methods, devices or implements does not constitute an endorsement by the Company.
AUSTIN ARMER, Editor 600 California Fruit Building Sacramento, California

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SPRECKELS SUGAR COMPANY

Incorporated August 6, 1897

Two Pine Street

San Francisco 11, California

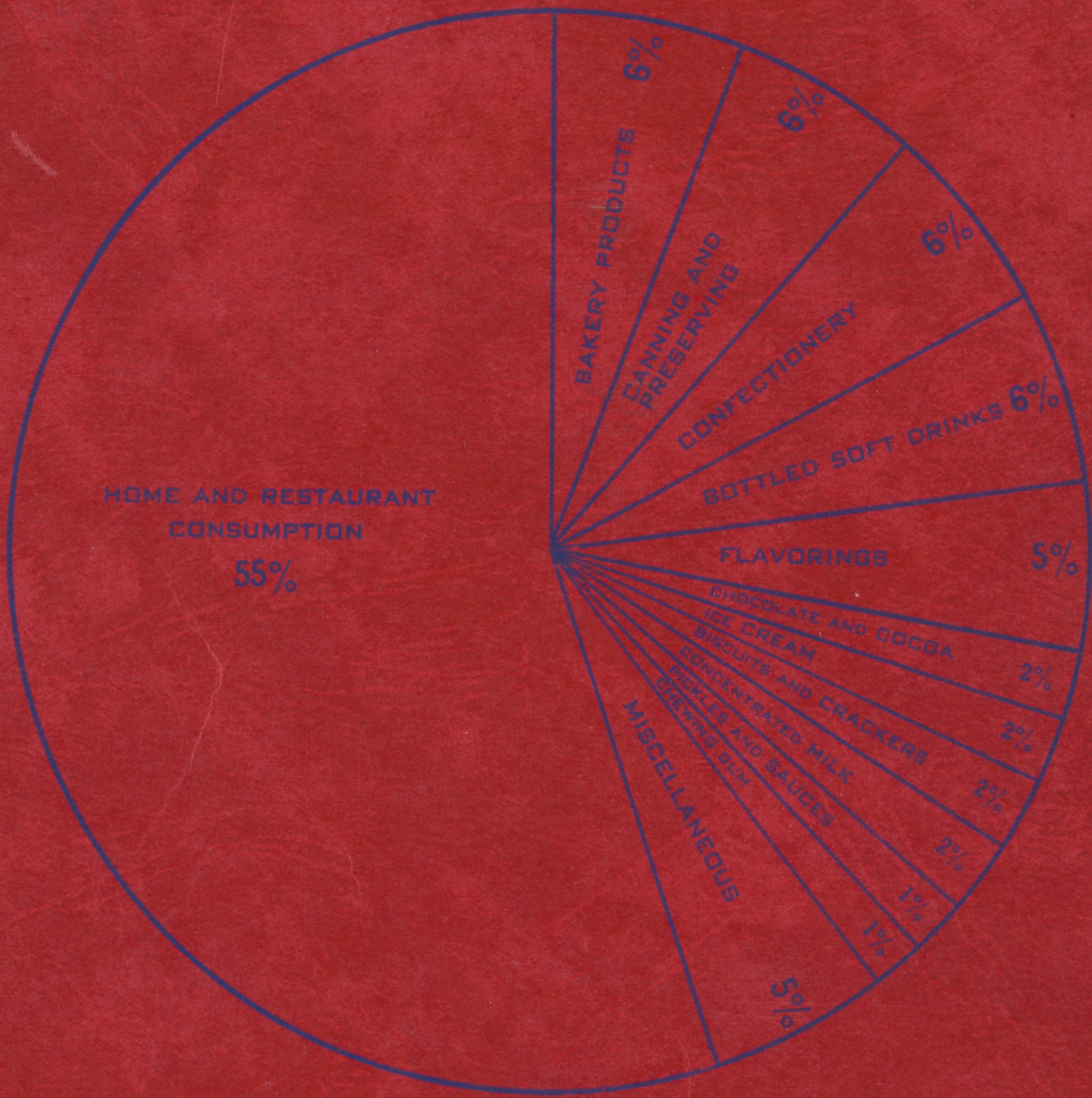
Authorized Capital Stock	$12,500,000.00
Capital Stock Outstanding	9,000,000.00

C. J. Moroney	President and Director
H. Beach Carpenter	Director
Virgil D. Dardi	Director
Charles de Bretteville	Director
Carl F. Huttlinger	Director
J. W. Mooney	Director
G. Vincent Pach	Director
John N. Rosekrans	Director
Brayton K. Wilbur	Director
Wharton K. Gray	Vice President
Bert K. Henry	Vice President and Treasurer
William H. Ottey	Vice President and Sales Manager
E. H. Kellberg	Secretary and Ass't Treasurer
Guy D. Manuel	General Agriculturist

SPRECKELS SUGAR COMPANY FACTORIES

	SPRECKELS CALIFORNIA	MANTECA CALIFORNIA	WOODLAND CALIFORNIA
			
Erected	1899	1917	1937
Superintendent	W. J. Resch	A. A. Norman	Ira A. Resch

WHO BUYS THE NATION'S SUGAR?



SOURCE: CENSUS OF MANUFACTURERS—U. S. DEPARTMENT OF AGRICULTURE